



# LACO ASSOCIATES

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June 16, 2005

3472.04

Humboldt County Department of Health and Human Services  
Division of Environmental Health  
100 H. Street, Suite 100  
Eureka, California 95501

Attention: Mr. Mark Verhey, C.E.G.

Subject: Groundwater Monitoring Report; Second Quarter 2005  
Former Totem Pole Market, 580 Fortuna Boulevard, Fortuna, California  
LOP No. 12028

Dear Mr. Verhey:

LACO ASSOCIATES (LACO) presents to the Humboldt County Division of Environmental Health (HCDEH) the results of groundwater monitoring for the second quarter of 2005. This report has been prepared for our client, Valerie Ellis.

Please call or email if you have any questions or concerns.

Sincerely,  
LACO ASSOCIATES

Caroline Levenda  
Staff Geologist

CJL:cs

Attachments

cc: Valerie Ellis

Christopher J. Watt  
PG 7586 Exp. 3/31/06



# GROUNDWATER MONITORING REPORT

## SECOND QUARTER 2005

Former Totem Pole Market  
580 Fortuna Boulevard, Fortuna, California  
LOP No. 12028; LACO Project No. 3472.04

### INTRODUCTION

Field activities were conducted on May 2, 2005, in accordance with generally accepted practices at this or similar locations. Please refer below to Tables A and B for the current groundwater monitoring regime and to the updated *Standard Operating Procedures* in Attachment 4 for details. A location and site map are provided as Figures 1 and 2, respectively. A key to abbreviations is included as Attachment 1.

### SITE CHRONOLOGY

- 1988: Two 1000-gallon underground storage tanks (USTs) closed in place by filling with concrete.
- 1994: Two 1000-gallon USTs removed from site; 180 cubic yards of soil was excavated; 550 gallon waste oil tank was removed.
- 1995 through 2005: Soil borings and monitoring wells were installed to characterize the site.

Table A: Sampling Event for May 2, 2005							
MONITORING WELL ID	SCREENED INTERVAL (feet)	DTW (feet)	PURGE METHOD	WATER QUALITY PARAMETERS	ANALYTICALS		SAMPLING SCHEDULE
					ORGANICS	INORGANICS	
MW1	5-15	10.17	DHP	pH, T, ECw, ORP, DO	TPHg, TPHd, BTEX, MTBE, DIPE, ETBE, TAME, TBA	NA	Quarterly
MW2	5-15	10.08	---	--	--		DTW Only
MW3	5-15	---	---	--	--		
MW4S	4-9	3.57	DHP	pH, T, ECw, ORP, DO	TPHg, TPHd, BTEX, MTBE, DIPE, ETBE, TAME, TBA		Quarterly
MW4D	13-18	11.13					
MW5	15-20	10.31					

### HYDRAULIC GRADIENT AND HYDROGEOLOGY

Due to differences in hydraulic conductivity, the site stratigraphy has allowed for two distinct water-bearing units; a perched water bearing unit in the fill material (0 to 2+ feet bgs) and a deep aquifer in the silty and gravelly sands encountered below 12 to 15 feet bgs.

The hydraulic gradient of the deep aquifer was calculated using monitoring wells MW1, MW2, and MW5D and was determined to have a N63°W trend and 1.68 percent slope. A hydraulic gradient map is provided as Figure 3.

## LABORATORY RESULTS

Laboratory analytical results from the May 2, 2005, quarterly sampling event are included below in Table B. Current and historical groundwater analytical data are included in Table 1, and copies of the laboratory analytical report are included as Attachment 3. Key to abbreviations can be found in Attachment 1.

<b>Table B: Analytical Results for May 2, 2005</b>								
<b>WELL</b>	<b>TPHg (µg/L)</b>	<b>TPHd (µg/L)</b>	<b>Benzene (µg/L)</b>	<b>Toluene (µg/L)</b>	<b>Ethylbenzene (µg/L)</b>	<b>Xylenes (µg/L)</b>	<b>MTBE (µg/L)</b>	<b>Additional Analytes (µg/L)</b>
<b>MW1</b>	<b>3,200</b>	<b>330</b>	<b>0.66</b>	ND<0.50	<b>2.9</b>	<b>0.62</b>	ND<1.0	<b>DIPE = 4.1</b> All others ND<1.0-10
<b>MW4S</b>	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	All others ND<1.0-10
<b>MW4D</b>	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	All others ND<1.0-10
<b>MW5</b>	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	All others ND<1.0-10

## DISCUSSION OF GROUNDWATER RESULTS

Analytical results for monitoring wells sampled during the second quarter of 2005 are generally consistent within the range of results reported for recent sampling events. For the current reporting period, all analytes at monitoring wells MW4S, MW4D, and MW5 are reported as not detected. The laboratory noted that the groundwater sample taken from monitoring well MW1 does not have a peak pattern consistent with gasoline and has material in the gasoline range. Also, the groundwater sample from monitoring well MW1 contains some material lighter than diesel and in the range of molecular weights of diesel, but the material does not exhibit the peak pattern typical of diesel oil. These comments indicate that the site contains older fuel range material which is weathered and degraded. Additional laboratory notes are included in the case narrative of the laboratory analytical results in Attachment 3.

### DIPE (Di-isopropyl Ether)

Di-isopropyl ether (DIPE) was detected in groundwater samples from monitoring well MW1 for this sampling event, in three of four quarterly sampling events in 2003, and also in last quarter's sampling event on February 28, 2005. DIPE concentrations have ranged from not detected to 4.3 ug/l and have shown no pattern consistent with other constituents.

Concentrations of benzene, toluene, ethylbenzene, and total xylenes (BTEX) have been historically decreasing while concentrations of total petroleum hydrocarbons as gasoline (TPHg) have been historically increasing since 2001 in groundwater samples taken from monitoring well MW1.

The source of DIPE is unknown. In 1988, two USTs were abandoned in place by filling with concrete. In 1994, the two USTs were removed and a 550-gallon waste oil tank was removed. If DIPE was used prior to 1988 as a gasoline additive, then the detection of DIPE in monitoring well MW1 may possibly be due to leaking USTs, dispensers, or lines. However, if DIPE was used as a gasoline additive after 1988, there is a possibility that the DIPE detection is from an unknown source elsewhere. Also, sampling for DIPE utilizing EPA method 8260B began in the year 2003 for this site. Thus, DIPE detections for previous years are unknown. However, DIPE is reportedly used as a solvent in paint thinners, stain removers, medicine, powder and paint cleaning; it has also been used as an extraction agent and gasoline additive (Reciprocal Net and FRIPP). Further investigation of surrounding commercial sites that may use gasoline, paints, paint thinners, or other solvents and the date of DIPE use as a gasoline additive may help determine the source of DIPE.

The DIPE water quality objective is 0.8 ug/l based on the California Regional Water Quality Control Board for the Central Valley Region (Marshack). Information regarding decay rates of DIPE can not be found at this time. Further investigation on the source of DIPE may be necessary for action to be taken and furthermore for site closure.

## **FUTURE WORK**

- Quarterly sampling will continue. The next quarterly sampling event is scheduled for August 2005.
- A report from the recent subsurface investigation is forthcoming.

## **REFERENCES**

(FRIPP) Fushun Research Institute of Petroleum and Petrochemicals, SINOPEC, "Production of diisopropyl ether through propene hydration" (2004-2005).  
<http://www.fripp.com.cn/en-0301060200.htm>

Marshack, J.B.- California Regional Water Quality Control Board, Central Valley Region, “Beneficial Use-Protective Water Quality Limits For Components of Petroleum-Based Fuels”, April 1, 2004.

[http://www.waterboards.ca.gov/centralvalley/available\\_documents/wq\\_goals/wq\\_limits\\_for\\_fuels.pdf](http://www.waterboards.ca.gov/centralvalley/available_documents/wq_goals/wq_limits_for_fuels.pdf)

Reciprocal Net, Partner Site, “Isopropyl Ether-Reciprocal Net Common Molecules” (2003).

<http://www.reciprocalnet.org/recipnet/showsample.jsp?sampleId=273...>

## **LIST OF FIGURES, TABLES, AND ATTACHMENTS**

Figure 1: Location Map

Figure 2: Site Map

Figure 3: Hydraulic Gradient (May 2, 2005)

Table 1: Historical Well Data and Groundwater Analytical Results

Attachment 1: Key to Abbreviations

Attachment 2: Groundwater Sampling: Field Data Sheets

Attachment 3: Laboratory Analytical Reports

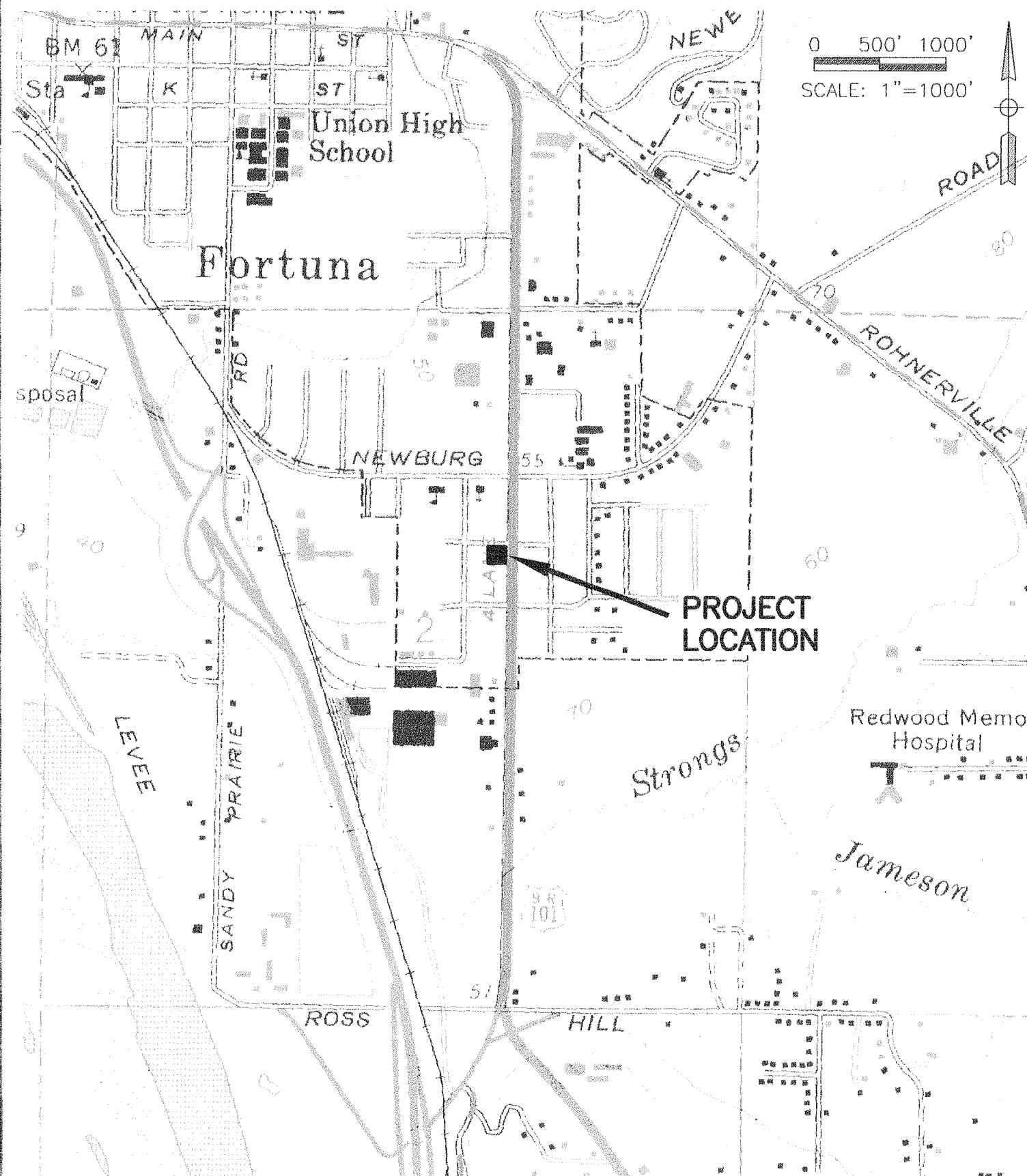
Attachment 4: Standard Operating Procedures

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PROJECT	REPORT OF FINDINGS	BY	RJM	FIGURE	1
CLIENT	TOTEM POLE MARKET	DATE	5/19/05	JOB NO.	
LOCATION	FORTUNA BLVD., FORTUNA, CA	CHECK			
	LOCATION MAP	SCALE	1"=1000'		3472.04



PROJECT	GROUNDWATER MONITORING REPORT	BY	RJM	FIGURE	2
CLIENT	TOTEM POLE MARKET	DATE	5/19/05	JOB NO.	3472.04
LOCATION	FORTUNA BLVD. FORTUNA, CA	CHECK			
	SITE MAP	SCALE	1"=30'		

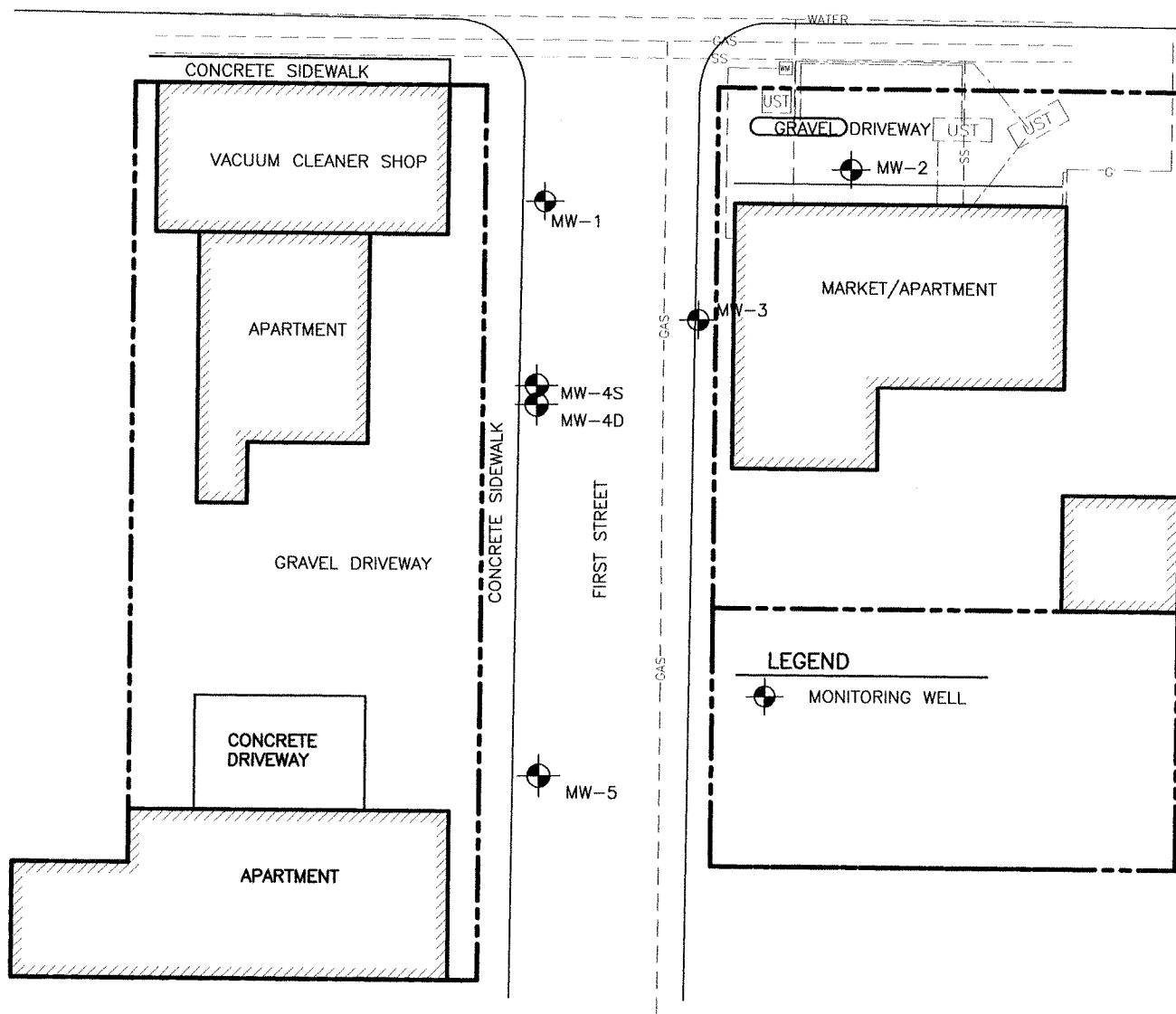


0 15' 30'



SCALE: 1"=30'

SOUTH FORTUNA BLVD.



PROJECT	GROUNDWATER MONITORING REPORT	BY	RJM	FIGURE	3
CLIENT	TOTEM POLE MARKET	DATE	5/19/05	JOB NO.	3472.04
LOCATION	FORTUNA BLVD. FORTUNA, CA	CHECK			
	HYDRAULIC GRADIENT MAP (5/02/05)	SCALE	1"=30'		



0 15' 30'



SCALE: 1"=30'

SOUTH FORTUNA BLVD.

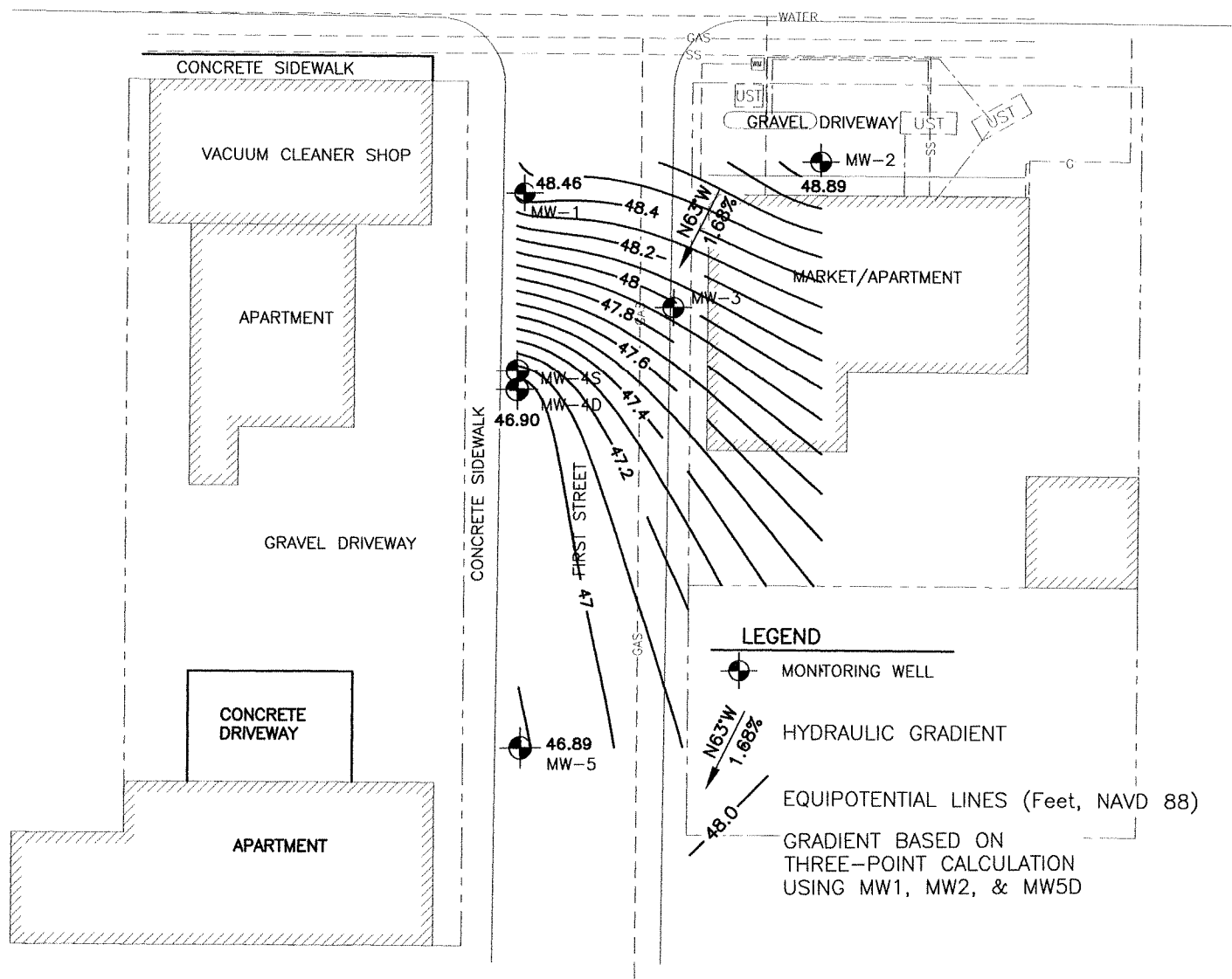




TABLE 1: MONITORING WELL DATA AND GROUNDWATER ANALYTICAL RESULTS

Former Totem Pole Market; LACO Project No. 3472.04

580 South Fortuna Boulevard, Fortuna, CA

LOP No. 12028

Groundwater Measurements				Analytical Results								
WELL/ Sample Date	Well Head Elevation (feet NAVD88)	Hydraulic Head (feet NAVD88)	Depth to Water (feet)	TPHg (µg/L)	TPHd (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Additional Analytes (µg/L)	
MW-1	8/12/1996	58.63	44.71	1,700	ND<500	72	ND<3.0	24	72	ND<10	---	
	9/9/1996		44.23	---	---	---	---	---	---	---	---	
	10/8/1996		44.23	---	---	---	---	---	---	---	---	
	11/25/1996		52.63	1,700	110	31	ND<5.0	38	59	ND<5.0	Lead = ND<0.02	
	1/9/1997		53.85	---	---	---	---	---	---	---	---	
	2/4/1997		53.71	930	330	1.8	ND<10	14	20	ND<5.0	---	
	3/19/1997		48.58	---	---	---	---	---	---	---	---	
	4/7/1997		46.97	---	---	---	---	---	---	---	---	
	5/1/1997		46.52	12.11	790	480	1.3	2.7	5.9	16.7	ND<5.0	---
	6/3/1997		45.99	12.64	---	---	---	---	---	---	---	---
	7/7/1997		45.06	13.57	---	---	---	---	---	---	---	---
	8/13/1997		44.65	13.98	---	---	---	---	---	---	---	---
	1/16/1998		49.31	9.32	---	---	---	---	---	---	---	---
	5/5/1998		48.84	9.79	1,000	190	2.8	ND<2.0	15	ND<10	ND<5.0	---
	2/22/1999		51.02	7.61	---	---	---	---	---	---	---	---
	3/5/1999		---	---	830	120	ND<5.0	ND<5.0	12	ND<5.0	ND<5.0	---
	5/3/2001		46.41	12.22	4,700	300	14	ND<30	28	38	ND<20	---
	9/4/2001		44.68	13.95	---	---	---	---	---	---	---	---
	11/9/2001		44.73	13.90	---	---	---	---	---	---	---	---
	2/25/2003		49.09	9.54	1,900	140	0.85	ND<0.50	5.5	0.74	ND<1.0	---
	5/16/2003		50.81	7.82	1,500	220	ND<0.50	ND<0.50	3.8	ND<0.50	ND<1.0	DIPE = 3.9 All others ND
	8/6/2003		45.04	13.59	2,000	280	1.4	ND<0.50	4.4	1.0	ND<1.0	DIPE = 4.3 All others ND
	11/11/2003		44.66	13.97	2,000	---	4.3	ND<0.50	3.4	1.8	ND<1.0	DIPE = 3.0 All others ND
	2/17/2004		52.67	5.96	2,600	290	ND<0.50	ND<0.50	5.0	0.53	ND<1.0	ND<1.0-1.0
	5/14/2004		46.32	12.31	2,200	140	1.2	ND<0.50	3.0	1.31	ND<1.0	ND<1.0-1.0
	8/17/2004		44.65	13.98	2,700	---	3.5	ND<0.50	3.1	0.87	ND<1.0	ND<1.0-1.0
	11/30/2004		44.67	13.96	2,900	---	10	ND<0.50	3.0	1.0	ND<1.0	ND<1.0-1.0
	2/28/2005	58.63	49.88	8.75	3,700	160	ND<0.50	ND<0.50	4.4	0.60	ND<1.0	DIPE = 2.3 All others ND
	5/2/2005		48.46	10.17	3,200	330	0.66	ND<0.50	2.9	0.62	ND<1.0	DIPE = 4.1 All others ND

TABLE 1: MONITORING WELL DATA AND GROUNDWATER ANALYTICAL RESULTS

Former Totem Pole Market; LACO Project No. 3472.04  
580 South Fortuna Boulevard, Fortuna, CA  
LOP No. 12028

Groundwater Measurements				Analytical Results							
WELL/ Sample Date	Well Head Elevation (feet NAVD88)	Hydraulic Head (feet NAVD88)	Depth to Water (feet)	TPHg (µg/L)	TPHd (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Additional Analytes (µg/L)
MW-2											
8/12/1996	58.97	41.80	17.17	ND<50	ND<500	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<5.0	---
9/9/1996		44.39	14.58	---	---	---	---	---	---	---	---
10/8/1996		44.41	14.56	---	---	---	---	---	---	---	---
11/25/1996		54.27	4.70	ND<50	ND<500	ND<0.5	ND<0.5	ND<0.5	0.77	ND<5.0	Lead = 0.028
1/9/1997		54.58	4.39	---	---	---	---	---	---	---	
2/4/1997		55.77	3.20	ND<50	ND<500	ND<0.5	ND<0.5	ND<0.5	ND<0.50	69	
3/19/1997		54.61	4.36	---	---	---	---	---	---	---	
4/7/1997		48.95	10.02	---	---	---	---	---	---	---	
5/1/1997		54.18	4.79	ND<50	ND<500	ND<0.5	0.55	ND<0.50	1.59	ND<5.0	
6/3/1997		45.17	13.80	---	---	---	---	---	---	---	
7/7/1997		44.79	14.18	---	---	---	---	---	---	---	
8/13/1997		44.79	14.18	---	---	---	---	---	---	---	
1/16/1998		45.34	13.63	---	---	---	---	---	---	---	
5/5/1998		47.40	11.57	ND<50	ND<500	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<5.0	
2/22/1999		46.32	12.65	---	---	---	---	---	---	---	
3/5/1999		---	---	ND<50	---	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<5.0	
5/3/2001		47.33	11.64	---	---	---	---	---	---	---	
9/4/2001		44.89	14.08	---	---	---	---	---	---	---	
11/9/2001		44.98	13.99	ND<50	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<5.0	
2/25/2003		55.62	3.35	---	---	---	---	---	---	---	
5/16/2003		54.25	4.72	---	---	---	---	---	---	---	
8/6/2003		45.27	13.70	---	---	---	---	---	---	---	
11/11/2003		44.93	14.04	---	---	---	---	---	---	---	
2/17/2004		57.75	1.22	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	ND<1.0-10
5/14/2004		46.23	12.74	---	---	---	---	---	---	---	---
8/17/2004		44.77	14.20	---	---	---	---	---	---	---	---
11/30/2004		45.94	13.03	---	---	---	---	---	---	---	---
2/28/2005	58.97	56.05	2.92	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	ND<1.0-10
5/2/2005		48.89	10.08	---	---	---	---	---	---	---	---

**TABLE 1: MONITORING WELL DATA AND GROUNDWATER ANALYTICAL RESULTS**

Former Totem Pole Market: LACO Project No. 3472.04

580 South Fortuna Boulevard, Fortuna, CA

LOP No. 12028

Groundwater Measurements				Analytical Results							
WELL/ Sample Date	Well Head Elevation (feet NAVD88)	Hydraulic Head (feet NAVD88)	Depth to Water (feet)	TPHg (µg/L)	TPHd (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Additional Analytes (µg/L)
MW-3	8/12/1996	58.85	41.90	16.95	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<5.0	Lead = 0.021
	9/9/1996		44.92	13.93	---	---	---	---	---	---	
	10/8/1996		44.06	14.79	---	---	---	---	---	---	
	11/25/1996		56.31	2.54	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<5.0	
	1/9/1997		56.27	2.58	---	---	---	---	---	---	
	2/4/1997		56.81	2.04	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<5.0	
	3/19/1997		55.88	2.97	---	---	---	---	---	---	
	4/7/1997		55.54	3.31	---	---	---	---	---	---	
	5/1/1997		56.53	2.32	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<5.0	
	6/3/1997		56.30	2.55	---	---	---	---	---	---	
	7/7/1997		48.10	10.75	---	---	---	---	---	---	
	8/13/1997		44.71	14.14	---	---	---	---	---	---	
	1/16/1998		58.34	0.51	---	---	---	---	---	---	
	5/5/1998		55.53	3.32	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<5.0	
	2/22/1999		57.85	1.00	---	---	---	---	---	---	
	3/5/1999		---	---	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<5.0	
	5/3/2001		55.90	2.95	---	---	---	---	---	---	
9/4/2001		44.70	14.15	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<5.0		
MW4S	11/9/2001		47.46	11.39	---	---	---	---	---	---	
	2/25/2003		54.61	4.24	---	---	---	---	---	---	
	5/16/2003		55.67	3.18	---	---	---	---	---	---	
	8/6/2003		44.83	14.02	---	---	---	---	---	---	
	11/11/2003		55.98	2.87	---	---	---	---	---	---	
	2/17/2004		58.11	0.74	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	
	5/14/2004		49.73	9.12	---	---	---	---	---	---	
MW4D	8/17/2004		44.70	14.15	---	---	---	---	---	---	
	11/30/2004		55.59	3.26	---	---	---	---	---	---	
	2/28/2005	58.85	---	---	---	---	---	---	---	---	
	5/2/2005		---	---	---	---	---	---	---	---	
MW5	2/28/2005	58.15	54.76	3.39	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	ND<1.0-1.0
	5/2/2005		54.58	3.57	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	ND<1.0-1.0
MW5	2/28/2005	58.03	46.10	11.93	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	ND<1.0-1.0
	5/2/2005		46.90	11.13	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	ND<1.0-1.0
ABBREVIATIONS AND LABORATORY NOTATIONS											
ND <: Not detected at or above the method detection limit shown											
---: Not analyzed or available											
µg/l: micrograms per liter											
TPHg: total petroleum hydrocarbons as gasoline											
TPHd: total petroleum hydrocarbons as diesel											
MTBE: methyl tertiary butyl ether											

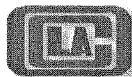
# *Attachment 1*

## KEY TO ABBREVIATIONS

KEY TO ABBREVIATIONS	
3/4"B	-- Three quarters of an inch diameter bailer
Alk	-- Alkalinity
BTEX	-- Benzene; Toluene; Ethylbenzene; m,p- and o- Xylenes
CO <sub>2</sub>	-- Carbon dioxide
COC	-- Chain of custody
Cr	-- Chromium
DHP	-- Down-hole-pump (submersible pump)
DIPE	-- Di-isopropyl Ether
Dis	-- Dissolved
DO	-- Dissolved Oxygen
DTW	-- Depth-to-Water
ECw	-- Electrical Conductivity in water
ETBE	-- Ethyl Tertiary Butyl Ether
Fe	-- Iron
FP	-- Free Product
Mn	-- Manganese
MTBE	-- Methyl Tertiary Butyl Ether
N	-- Nitrogen
NA	-- Not Applicable
ND<50	-- non-detect at reporting limits shown
NO <sub>3</sub>	-- Nitrate
NOT ACTIVE	-- Sample not analyzed for parameter during current sampling event
ORP	-- Oxidation Reduction Potential
P	-- Phosphorous
PCP/TCP	-- penta- tetra- tri- chlorophenols
pH	-- Potential of hydrogen
SGC	-- Silica gel cleanup
SO <sub>4</sub>	-- Sulfate
T	-- Temperature
T&P	-- Tape and Paste
TAME	-- Tertiary Amyl Methyl Ether
TBA	-- Tetiary Butyl Alcohol
TBF	-- Tertiary Butyl Formate
TIC	-- Total Inorganic Carbon
TOC	-- Total Organic Carbon
Tot	-- Total
TPHd	-- Total Petroluem Hydrocarbons as Diesel
TPHg	-- Total Petroluem Hydrocarbons as Gasoline
TPHk	-- Total Petroluem Hydrocarbons as Kerosene
TPHmo	-- Total Petroluem Hydrocarbons as Motor Oil
TPHs	-- Total Petroluem Hydrocarbons as Solvent
µg/L	-- Micro grams per liter (parts per billion)

\*\*\*Note that not all abbreviations in this key are used in the report.

## *Attachment 2*



# LACO ASSOCIATES

CONSULTING ENGINEERS

21 West Fourth Street, Eureka, CA 95501

TEL 707.443.5054

FAX 707.443.0553

Page 1 of 2

Project

Name: **Forks / Totem Pole Market**

Tech: **SJD**

Mob/Demob time: **.25 / .25**

Project No.: **3472.04**

Travel time: **1.0**

Date: **5-2-05**

Time on site: **12:20**

Global ID No.: **T0602300028**

Time off site: **3:30**

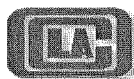
PM: **CJW**

Mileage: **38**

WELL No.:	MW3	MW2	MW1	MW4S	MW4D						
DIAMETER (in)	2.00	2.00	2.00	2.00	2.00						
SCREENED INTERVAL (ft)	5-15	5-15	5-15	4-9	13-18						
DEPTH TO WATER (ft)		10.08	10.17	3.57	11.13						
FIELD INTRINSICS	INITIAL	FINAL	INITIAL	FINAL	INITIAL	FINAL	INITIAL	FINAL	INITIAL	FINAL	
	pH										
	TEMP (°C)										
	ECW (µmhos)										
	ORP (mV)					-14	-61	36	166	-48	-113
	DO (mg/L)					0.97	0.33	1.03	0.87	1.47	0.79
OTHER (units)											
PURGE	TIME				1:08	1:18	1:37	1:53	2:09	2:27	
	METHOD (DHP/CB/B)					DHP		DHP		DHP	
	RATE (Lpm)					0.20		0.19		0.17	
	VOLUME (L)					2.0		3.0		3.0	
	COLOR					CLEAR	CLOUDY YELLOW TINT	CLEAR	CLOUDY	CLEAR	CLOUDY
	ODOR					MED. ROBBED/FUEL/ORGANIC		NONE		LIGHT SULFUR	
	INTAKE DEPTH (FEET)					14.0		7.0		15.5	
SAMPLE	TIME				1:19		1:55		2:29		
	METHOD (DHP/CB/B)					DHP		DHP		DHP	
	ANALYTES	DTW ONLY		DTW ONLY		8260 List 1; TPHd w/SGC		8260 List 1; TPHd w/SGC		8260 List 1; TPHd w/SGC	
	TOTAL DRAWDOWN (FEET)					1.22		1.30		1.53	
	REMARKS										
WELL CONDITION	WATER TRUCK PARKED OVER WELL - UNABLE TO MOVE		good		good		good		good		
WASTE DRUMS	4 DOT DRUMS ONSITE										

DHP=DOWN HOLE PUMP CB=CHECK BALL B=BAILER FD=FIELD DUPLICATE MB=METHOD BLANK FF=FIELD FILTERED

REVISED:5/2/2005



# LACO ASSOCIATES

CONSULTING ENGINEERS

21 West Fourth Street, Eureka, CA 95501

TEL 707.443.5054

FAX 707.443.0553

Page 2 of 2

Project

Name: **Forks / Totem Pole Market**

Tech: **SJD**

Mob/Demob time: **1:25/2:25**

Project No.: **3472.04**

Travel time: **1.0**

Date: **5-2-05**

Time on site: **12:20**

Global ID No.: **T0602300028**

Time off site: **3:30**

PM: **CJW**

Mileage: **38**

WELL No.:		<b>MW5</b>									
DIAMETER (in)		<b>2.00</b>									
SCREENED INTERVAL (ft)		<b>15-20</b>									
DEPTH TO WATER (ft)		<b>10.21</b>									
		INITIAL	FINAL	INITIAL	FINAL	INITIAL	FINAL	INITIAL	FINAL	INITIAL	FINAL
FIELD INTRINSICS	pH										
	TEMP (°C)										
	E <sub>ow</sub> (μmhos)										
	ORP (mV)	<b>-136</b>	<b>-167</b>								
	DO (mg/L)	<b>1.35</b>	<b>0.47</b>								
	OTHER (units)										
PURGE	TIME	<b>2:46</b>	<b>2:58</b>								
	METHOD (DHP/CB/B)	<b>DHP</b>									
	RATE (Lpm)	<b>0.19</b>									
	VOLUME (L)	<b>2.25</b>									
	COLOR	<b>CLEAR</b>	<b>LT. GREY TINT</b>								
	ODOR	<b>LIGHT SULFUR</b>									
	INTAKE DEPTH (FEET)	<b>17.0</b>									
SAMPLE	TIME	<b>3:00</b>									
	METHOD (DHP/CB/B)	<b>DHP</b>									
	ANALYTES	<b>8260 List 1; TPHd w/SGC</b>									
	TOTAL DRAWDOWN (FEET)	<b>0.24</b>									
	REMARKS										
WELL CONDITION		<b>good</b>									
WASTE DRUMS											

DHP=DOWN HOLE PUMP CB=CHECK BALL B=BAILER FD=FIELD DUPLICATE MB=METHOD BLANK FF=FIELD FILTERED

REVISED:5/2/2005



Project Name:

## FORKS/TOTEM POLE MARKET

Tech: SJD

Date: 5-2-05

Project No.: 3472.04

[illegible]

WELL ID: MW4B						WELL ID: MW5					
TIME	pH	TEMP (°C)	E <sub>cw</sub> (μmhos)	ORP (mV)	DO (mg/L)	TIME	pH	TEMP (°C)	E <sub>cw</sub> (μmhos)	ORP (mV)	DO (mg/L)
2:11	~	~	~	-53	1.14	2:48	~	~	~	-158	1.03
2:13	~	~	~	-62	0.66	2:50	~	~	~	-168	0.94
2:15	~	~	~	-71	0.52	2:52	~	~	~	-170	0.87
2:17	~	~	~	-79	0.50	2:54	~	~	~	-169	0.65
2:19	~	~	~	-89	0.54	2:56	~	~	~	-168	0.54
2:21	~	~	~	-98	0.60	2:58	~	~	~	-167	0.47
2:23	~	~	~	-109	0.66						
2:25	~	~	~	-113	0.67						
2:27	~	~	~	-113	0.72						

[illegible]



5680 West End Road • Arcata • CA 95521-9202  
707-822-4649 Fax 707-822-6831

# Chain of Custody

LABORATORY NUMBER:

Attention: David Gervan  
Results & Invoice to: Laco Associates  
Address: 21 W. 4th St. Eureka CA 95501  
  
Phone: (707) 443-5054  
Copies of Report to: Ms. Valerie Ellis  
Forks Estate P.O. Box 1092 Kodiak, AK 99615 (907) 486-2042  
Sampler (Sign & Print): SJD

## PROJECT INFORMATION

Project Number: 3472.04  
Project Name: Totem Pole Market  
Purchase Order Number: TASK-3023

[illegible][illegible]

TAT: ☐ 24 Hr ☐ 48 Hr ☐ 5 Day ☐ 5-7 Day

☒ STD (2-3 wk) ☐ Other:

PRIOR AUTHORIZATION IS REQUIRED FOR RUSHES

**REPORTING REQUIREMENTS:** State Forms ☐

Preliminary: FAX ☒ Verbal ☐ By:                      

Final Report: FAX ☐ Verbal ☐ By:                      

**CONTAINER CODES:** 1— $\frac{1}{2}$  gal. pl; 2—250 ml pl; 3—500 ml pl; 4—1 L Nalgene; 5—250 ml BG; 6—500 ml BG; 7—1 L BG; 8—1 L cg; 9—40 ml VOA; 10—125 ml VOA; 11—4 oz glass jar; 12—8 oz glass jar; 13—brass tube; 14—other

**PRESERVATIVE CODES:** a—HNO<sub>3</sub>; b—HCl; c—H<sub>2</sub>SO<sub>4</sub>;  
d—Na<sub>2</sub>S<sub>2</sub>O<sub>5</sub>; e—NaOH; f—C<sub>2</sub>H<sub>5</sub>O<sub>2</sub>Cl; g—other

### **SAMPLE CONDITION/SPECIAL INSTRUCTIONS**

## GEOTRACKER

Gold, intact

## SAMPLE DISPOSAL

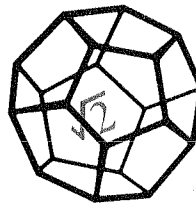
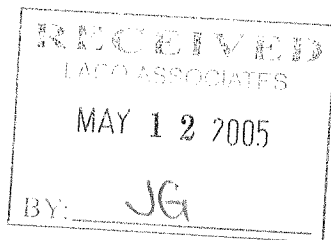
☒ NCL Disposal of Non-Contaminated

CHAIN OF CUSTODY SEALS Y/N/NA  
SHIPPED VIA: UPS Air-Ex Fed-Ex Bus Hand

\***MATRIX:** DW=Drinking Water; Eff=Effluent; Inf=Influent; SW=Surface Water; GW=Ground Water; S=Soil; O=Other.

**ALL CONTAMINATED NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT**

## *Attachment 3*



**NORTH COAST  
LABORATORIES LTD.**

May 11, 2005

LACO Associates  
P.O. Box 1023  
Eureka, CA 95502

DRG  
CJW

Order No.: 0505025  
Invoice No.: 50012  
PO No.: TASK-3023  
ELAP No. 1247-Expires July 2006

Attn: David Gervan

RE: 3472.04, Totem Pole Market

**SAMPLE IDENTIFICATION**

Fraction	Client Sample Description
01A	3472-MW1-W
01D	3472-MW1-W
02A	3472-MW4S-W
02D	3472-MW4S-W
03A	3472-MW4D-W
03D	3472-MW4D-W
04A	3472-MW5-W
04D	3472-MW5-W
05A	3472-QCTB-W

ND = Not Detected at the Reporting Limit

Limit = Reporting Limit

All solid results are expressed on a wet-weight basis unless otherwise noted.

**REPORT CERTIFIED BY**

Laboratory Supervisor(s)

QA Unit

Jesse G. Chaney, Jr.  
Laboratory Director

**CLIENT:** LACO Associates  
**Project:** 3472.04, Totem Pole Market  
**Lab Order:** 0505025

**CASE NARRATIVE**

---

All samples submitted for a silica gel cleanup were initially analyzed for diesel. The samples showing no detectable levels of the analyte were not subjected to the cleanup procedure.

**TPH as Diesel with Silica Gel Cleanup:**

Sample 3472-MW1-W contains some material lighter than diesel, and material in the diesel range of molecular weights, but the material does not exhibit the peak pattern typical of diesel oil.

The surrogate recovery for sample 3472-MW1-W was outside of the acceptance limits. The surrogate recoveries for the quality control samples were within the acceptance limits. This indicates that the low surrogate recovery may be due to matrix effects from the sample.

**Gasoline Components/Additives:**

Sample 3472-MW1-W does not present a peak pattern consistent with that of gasoline. The reported result represents the amount of material in the gasoline range.

The surrogate recovery for sample 3472-MW1-W was outside of the acceptance limits. The surrogate recoveries for the quality control samples were within the acceptance limits. This indicates that the low surrogate recovery may be due to matrix effects from the sample.

Date: 11-May-05  
WorkOrder: 0505025

## ANALYTICAL REPORT

Client Sample ID: 3472-MW1-W

Received: 5/2/05

Collected: 5/2/05 0:00

Lab ID: 0505025-01A

Matrix: Groundwater

Test Name: Gasoline Components/Additives

Reference: LUFT/EPA 8260B Modified

<u>Parameter</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<u>Extracted</u>	<u>Analyzed</u>
Methyl tert-butyl ether (MTBE)	ND	1.0	µg/L	1.0		5/4/05
Tert-butyl alcohol (TBA)	ND	10	µg/L	1.0		5/4/05
Di-isopropyl ether (DIPE)	4.1	1.0	µg/L	1.0		5/4/05
Ethyl tert-butyl ether (ETBE)	ND	1.0	µg/L	1.0		5/4/05
Benzene	0.66	0.50	µg/L	1.0		5/4/05
Tert-amyl methyl ether (TAME)	ND	1.0	µg/L	1.0		5/4/05
Toluene	ND	0.50	µg/L	1.0		5/4/05
Ethylbenzene	2.9	0.50	µg/L	1.0		5/4/05
m,p-Xylene	0.62	0.50	µg/L	1.0		5/4/05
o-Xylene	ND	0.50	µg/L	1.0		5/4/05
Surrogate: 1,4-Dichlorobenzene-d4	73.1	80.8-139	% Rec	1.0		5/4/05

Test Name: TPH as Gasoline

Reference: LUFT/EPA 8260B Modified

<u>Parameter</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<u>Extracted</u>	<u>Analyzed</u>
TPHC Gasoline	3,200	50	µg/L	1.0		5/4/05

Client Sample ID: 3472-MW1-W

Received: 5/2/05

Collected: 5/2/05 0:00

Lab ID: 0505025-01D

Matrix: Groundwater

Test Name: TPH as Diesel with Silica Gel Cleanup

Reference: EPA 3510/3630/GCFID(LUFT)/8015B

<u>Parameter</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<u>Extracted</u>	<u>Analyzed</u>
TPHC Diesel (C12-C22)	330	50	µg/L	1.0	5/5/05	5/9/05
Surrogate: N-Tricosane	66.7	70-130	% Rec	1.0	5/5/05	5/9/05

Date: 11-May-05  
WorkOrder: 0505025

## ANALYTICAL REPORT

Client Sample ID: 3472-MW4S-W

Received: 5/2/05

Collected: 5/2/05 0:00

Lab ID: 0505025-02A

Matrix: Groundwater

Test Name: Gasoline Components/Additives

Reference: LUFT/EPA 8260B Modified

<u>Parameter</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<u>Extracted</u>	<u>Analyzed</u>
Methyl tert-butyl ether (MTBE)	ND	1.0	µg/L	1.0		5/3/05
Tert-butyl alcohol (TBA)	ND	10	µg/L	1.0		5/3/05
Di-isopropyl ether (DIPE)	ND	1.0	µg/L	1.0		5/3/05
Ethyl tert-butyl ether (ETBE)	ND	1.0	µg/L	1.0		5/3/05
Benzene	ND	0.50	µg/L	1.0		5/3/05
Tert-amyl methyl ether (TAME)	ND	1.0	µg/L	1.0		5/3/05
Toluene	ND	0.50	µg/L	1.0		5/3/05
Ethylbenzene	ND	0.50	µg/L	1.0		5/3/05
m,p-Xylene	ND	0.50	µg/L	1.0		5/3/05
o-Xylene	ND	0.50	µg/L	1.0		5/3/05
Surrogate: 1,4-Dichlorobenzene-d4	88.8	80.8-139	% Rec	1.0		5/3/05

Test Name: TPH as Gasoline

Reference: LUFT/EPA 8260B Modified

<u>Parameter</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<u>Extracted</u>	<u>Analyzed</u>
TPHC Gasoline	ND	50	µg/L	1.0		5/3/05

Client Sample ID: 3472-MW4S-W

Received: 5/2/05

Collected: 5/2/05 0:00

Lab ID: 0505025-02D

Matrix: Groundwater

Test Name: TPH as Diesel

Reference: EPA 3510/GCFID(LUFT)/EPA 8015B

<u>Parameter</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<u>Extracted</u>	<u>Analyzed</u>
TPHC Diesel (C12-C22)	ND	50	µg/L	1.0	5/4/05	5/4/05
Surrogate: N-Tricosane	95.4	70-130	% Rec	1.0	5/4/05	5/4/05



Date: 11-May-05

WorkOrder: 0505025

## ANALYTICAL REPORT

Client Sample ID: 3472-MW4D-W

Received: 5/2/05

Collected: 5/2/05 0:00

Lab ID: 0505025-03A

Matrix: Groundwater

Test Name: Gasoline Components/Additives

Reference: LUFT/EPA 8260B Modified

<u>Parameter</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<u>Extracted</u>	<u>Analyzed</u>
Methyl tert-butyl ether (MTBE)	ND	1.0	µg/L	1.0		5/3/05
Tert-butyl alcohol (TBA)	ND	10	µg/L	1.0		5/3/05
Di-isopropyl ether (DIPE)	ND	1.0	µg/L	1.0		5/3/05
Ethyl tert-butyl ether (ETBE)	ND	1.0	µg/L	1.0		5/3/05
Benzene	ND	0.50	µg/L	1.0		5/3/05
Tert-amyl methyl ether (TAME)	ND	1.0	µg/L	1.0		5/3/05
Toluene	ND	0.50	µg/L	1.0		5/3/05
Ethylbenzene	ND	0.50	µg/L	1.0		5/3/05
m,p-Xylene	ND	0.50	µg/L	1.0		5/3/05
o-Xylene	ND	0.50	µg/L	1.0		5/3/05
Surrogate: 1,4-Dichlorobenzene-d4	87.9	80.8-139	% Rec	1.0		5/3/05

Test Name: TPH as Gasoline

Reference: LUFT/EPA 8260B Modified

<u>Parameter</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<u>Extracted</u>	<u>Analyzed</u>
TPHC Gasoline	ND	50	µg/L	1.0		5/3/05

Client Sample ID: 3472-MW4D-W

Received: 5/2/05

Collected: 5/2/05 0:00

Lab ID: 0505025-03D

Matrix: Groundwater

Test Name: TPH as Diesel

Reference: EPA 3510/GCFID(LUFT)/EPA 8015B

<u>Parameter</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<u>Extracted</u>	<u>Analyzed</u>
TPHC Diesel (C12-C22)	ND	50	µg/L	1.0	5/4/05	5/4/05
Surrogate: N-Tricosane	90.6	70-130	% Rec	1.0	5/4/05	5/4/05





Date: 11-May-05  
WorkOrder: 0505025

## ANALYTICAL REPORT

Client Sample ID: 3472-MW5-W  
Lab ID: 0505025-04A Matrix: Groundwater

Received: 5/2/05

Collected: 5/2/05 0:00

Test Name: Gasoline Components/Additives

Reference: LUFT/EPA 8260B Modified

<u>Parameter</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<u>Extracted</u>	<u>Analyzed</u>
Methyl tert-butyl ether (MTBE)	ND	1.0	µg/L	1.0		5/3/05
Tert-butyl alcohol (TBA)	ND	10	µg/L	1.0		5/3/05
Di-isopropyl ether (DIPE)	ND	1.0	µg/L	1.0		5/3/05
Ethyl tert-butyl ether (ETBE)	ND	1.0	µg/L	1.0		5/3/05
Benzene	ND	0.50	µg/L	1.0		5/3/05
Tert-amyl methyl ether (TAME)	ND	1.0	µg/L	1.0		5/3/05
Toluene	ND	0.50	µg/L	1.0		5/3/05
Ethylbenzene	ND	0.50	µg/L	1.0		5/3/05
m,p-Xylene	ND	0.50	µg/L	1.0		5/3/05
o-Xylene	ND	0.50	µg/L	1.0		5/3/05
Surrogate: 1,4-Dichlorobenzene-d4	88.7	80.8-139	% Rec	1.0		5/3/05

Test Name: TPH as Gasoline

Reference: LUFT/EPA 8260B Modified

<u>Parameter</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<u>Extracted</u>	<u>Analyzed</u>
TPHC Gasoline	ND	50	µg/L	1.0		5/3/05

Client Sample ID: 3472-MW5-W  
Lab ID: 0505025-04D Matrix: Groundwater

Received: 5/2/05

Collected: 5/2/05 0:00

Test Name: TPH as Diesel

Reference: EPA 3510/GCFID(LUFT)/EPA 8015B

<u>Parameter</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<u>Extracted</u>	<u>Analyzed</u>
TPHC Diesel (C12-C22)	ND	50	µg/L	1.0	5/4/05	5/5/05
Surrogate: N-Tricosane	96.8	70-130	% Rec	1.0	5/4/05	5/5/05



Date: 11-May-05

WorkOrder: 0505025

# ANALYTICAL REPORT

Client Sample ID: 3472-QCTB-W

Received: 5/2/05

Collected: 5/2/05 0:00

Lab ID: 0505025-05A

Matrix: Trip Blank

Test Name: Gasoline Components/Additives

Reference: LUFT/EPA 8260B Modified

<u>Parameter</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<u>Extracted</u>	<u>Analyzed</u>
Methyl tert-butyl ether (MTBE)	ND	1.0	µg/L	1.0		5/3/05
Tert-butyl alcohol (TBA)	ND	10	µg/L	1.0		5/3/05
Di-isopropyl ether (DIPE)	ND	1.0	µg/L	1.0		5/3/05
Ethyl tert-butyl ether (ETBE)	ND	1.0	µg/L	1.0		5/3/05
Benzene	ND	0.50	µg/L	1.0		5/3/05
Tert-amyl methyl ether (TAME)	ND	1.0	µg/L	1.0		5/3/05
Toluene	ND	0.50	µg/L	1.0		5/3/05
Ethylbenzene	ND	0.50	µg/L	1.0		5/3/05
m,p-Xylene	ND	0.50	µg/L	1.0		5/3/05
o-Xylene	ND	0.50	µg/L	1.0		5/3/05
Surrogate: 1,4-Dichlorobenzene-d4	88.5	80.8-139	% Rec	1.0		5/3/05

Test Name: TPH as Gasoline

Reference: LUFT/EPA 8260B Modified

<u>Parameter</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<u>Extracted</u>	<u>Analyzed</u>
TPHC Gasoline	ND	50	µg/L	1.0		5/3/05



**CLIENT:** LACO Associates  
**Work Order:** 0505025  
**Project:** 3472.04, Totem Pole Market

**QC SUMMARY REPORT**  
Method Blank

Sample ID	MB-5/3/05	Batch ID: R34720	Test Code: 8260OXYW	Units: µg/L	Analysis Date 5/3/05 9:14:00 AM			Prep Date			
Client ID:		Run ID:	ORGCMS2_050503B	SeqNo:	503088						
Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Methyl tert-butyl ether (MTBE)	ND	1.0									
Tert-butyl alcohol (TBA)	ND	10									
Di-isopropyl ether (DIPE)	ND	1.0									
Ethyl tert-butyl ether (ETBE)	ND	1.0									
Benzene	ND	0.50									
Tert-amyl methyl ether (TAME)	ND	1.0									
Toluene	0.1712	0.50									J
Ethylbenzene	0.1741	0.50									J
m,p-Xylene	0.2467	0.50									J
o-Xylene	0.2322	0.50									J
1,4-Dichlorobenzene-d4	0.869	0.10	1.00	0	86.9%	81	139	0			

Sample ID	MB-5/3/05	Batch ID: R34719	Test Code: GASW-MS	Units: µg/L	Analysis Date	5/3/05 9:14:00 AM	Prep Date				
Client ID:		Run ID:	ORGCMS2_050503A		SeqNo:	503071					
Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Gasoline	19.98	50									J

Sample ID	MB-13454	Batch ID: 13454	Test Code: SGTPHDW	Units: µg/L	Analysis Date	5/9/05 3:57:34 PM	Prep Date	5/5/05			
Client ID:		Run ID: ORGC5_050509A			SeqNo: 504023						
Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Diesel (C12-C22)	29.24	50									J
N-Tricosane	45.9	0.10	50.0	0	91.8%	70	130	0			

**Qualifiers:** ND - Not Detected at the Reporting Limit  
J - Analyte detected below quantitation limits  
S - Spike Recovery outside accepted recovery limits  
R - RPD outside accepted recovery limits  
B - Analyte detected in the associated Method Blank

CLIENT: LACO Associates

Work Order: 0505025

Project: 3472.04, Totem Pole Market

QC SUMMARY REPORT

Method Blank

Sample ID	MB-13446	Batch ID: 13446	Test Code: TPHDIW	Units: µg/L	Analysis Date	5/4/05 6:44:06 PM	Prep Date	5/4/05				
Client ID:		Run ID: ORGC7_050504B			SeqNo:	503358						
Analyte		Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

TPHC Diesel (C12-C22)	ND	50										
N-Tricosane	43.6	0.10	50.0	0	87.2%	70	130	0				

Qualifiers:	ND - Not Detected at the Reporting Limit	S - Spike Recovery outside accepted recovery limits	B - Analyte detected in the associated Method Blank
	J - Analyte detected below quantitation limits	R - RPD outside accepted recovery limits	

# North Coast Laboratories, Ltd.

Date: 11-May-05

**CLIENT:** LACO Associates

**Work Order:** 0505025

**Project:** 3472.04, Totem Pole Market

## QC SUMMARY REPORT

Laboratory Control Spike

Sample ID	LCS-05304	Batch ID: R34720	Test Code: 8260OXYW	Units: µg/L	Analysis Date	5/3/05 5:11:00 AM	Prep Date				
Client ID:		Run ID:	ORGCMS2_050503B		SeqNo:	503085					
Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Methyl tert-butyl ether (MTBE)	18.79	1.0	20.0	0	94.0%	80	120	0			
Tert-butyl alcohol (TBA)	353.8	10	400	0	88.5%	25	162	0			
Di-isopropyl ether (DIPE)	19.03	1.0	20.0	0	95.2%	80	120	0			
Ethyl tert-butyl ether (ETBE)	18.81	1.0	20.0	0	94.1%	77	120	0			
Benzene	19.68	0.50	20.0	0	98.4%	78	117	0			
Tert-amyl methyl ether (TAME)	19.90	1.0	20.0	0	99.5%	64	136	0			
Toluene	18.68	0.50	20.0	0	93.4%	80	120	0			
Ethylbenzene	20.37	0.50	20.0	0	102%	80	120	0			
m,p-Xylene	40.68	0.50	40.0	0	102%	80	120	0			
o-Xylene	20.31	0.50	20.0	0	102%	80	120	0			
1,4-Dichlorobenzene-d4	1.12	0.10	1.00	0	112%	81	139	0			

Sample ID	LCSD-05304	Batch ID: R34720	Test Code: 8260OXYW	Units: µg/L	Analysis Date	5/3/05 5:42:00 AM	Prep Date					
Client ID:		Run ID: ORGCMS2_050503B	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Analyte	Result											
Methyl tert-butyl ether (MTBE)	19.06	1.0	20.0	0	0	95.3%	80	120	18.8	1.42%	20	
Tert-butyl alcohol (TBA)	358.5	10	400	0	0	89.6%	25	162	354	1.31%	20	
Di-isopropyl ether (DIPE)	19.04	1.0	20.0	0	0	95.2%	80	120	19.0	0.0206%	20	
Ethyl tert-butyl ether (ETBE)	18.74	1.0	20.0	0	0	93.7%	77	120	18.8	0.389%	20	
Benzene	19.39	0.50	20.0	0	0	97.0%	78	117	19.7	1.47%	20	
Tert-amyl methyl ether (TAME)	20.30	1.0	20.0	0	0	101%	64	136	19.9	2.00%	20	
Toluene	18.66	0.50	20.0	0	0	93.3%	80	120	18.7	0.0793%	20	
Ethylbenzene	19.85	0.50	20.0	0	0	99.3%	80	120	20.4	2.58%	20	
m,p-Xylene	40.17	0.50	40.0	0	0	100%	80	120	40.7	1.26%	20	
o-Xylene	20.25	0.50	20.0	0	0	101%	80	120	20.3	0.319%	20	
1,4-Dichlorobenzene-d4	1.14	0.10	1.00	0	0	114%	81	139	1.12	2.26%	20	

**Qualifiers:** ND - Not Detected at the Reporting Limit  
J - Analyte detected below quantitation limits

S - Spike Recovery outside accepted recovery limits  
R - RPD outside accepted recovery limits

B - Analyte detected in the associated Method Blank

CLIENT: LACO Associates

Work Order: 0505025

Project: 3472.04, Totem Pole Market

## QC SUMMARY REPORT

Laboratory Control Spike

Sample ID	LCS-05305	Batch ID: R34719	Test Code: GASW-MS	Units: µg/L	Analysis Date 5/3/05 7:13:00 AM	Prep Date						
Client ID:		Run ID: ORGCMS2_050503A			SeqNo: 503068							
Analyte		Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Gasoline		1,111	50	1,000	0	111%	80	120	0			
Sample ID	LCSD-05305	Batch ID: R34719	Test Code: GASW-MS	Units: µg/L	Analysis Date 5/3/05 7:43:00 AM	Prep Date						
Client ID:		Run ID: ORGCMS2_050503A			SeqNo: 503069							
Analyte		Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Gasoline		1,105	50	1,000	0	111%	80	120	1,110	0.523%	20	
Sample ID	LCS-13454	Batch ID: 13454	Test Code: SGTPHDW	Units: µg/L	Analysis Date 5/9/05 2:01:46 PM	Prep Date 5/5/05						
Client ID:		Run ID: ORGC5_050509A			SeqNo: 504021							
Analyte		Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Diesel (C12-C22)		453.5	50	500	0	90.7%	40	107	0			
N-Tricosane		53.6	0.10	50.0	0	107%	70	130	0			
Sample ID	LCSD-13454	Batch ID: 13454	Test Code: SGTPHDW	Units: µg/L	Analysis Date 5/9/05 2:31:11 PM	Prep Date 5/5/05						
Client ID:		Run ID: ORGC5_050509A			SeqNo: 504022							
Analyte		Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Diesel (C12-C22)		418.5	50	500	0	83.7%	40	107	454	8.03%	15	
N-Tricosane		52.9	0.10	50.0	0	106%	70	130	53.6	1.27%	15	
Sample ID	LCS-13446	Batch ID: 13446	Test Code: TPHDIW	Units: µg/L	Analysis Date 5/4/05 5:10:15 PM	Prep Date 5/4/05						
Client ID:		Run ID: ORGC7_050504B			SeqNo: 503355							
Analyte		Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Diesel (C12-C22)		487.6	50	500	0	97.5%	67	120	0			
N-Tricosane		50.5	0.10	50.0	0	101%	70	130	0			

Qualifiers: ND - Not Detected at the Reporting Limit  
J - Analyte detected below quantitation limits

S - Spike Recovery outside accepted recovery limits  
R - RPD outside accepted recovery limits

B - Analyte detected in the associated Method Blank

**CLIENT:** LACO Associates  
**Work Order:** 0505025  
**Project:** 3472.04, Totem Pole Market

**QC SUMMARY REPORT**  
Laboratory Control Spike Duplicate

Sample ID	LCSD-13446	Batch ID: 13446	Test Code: TPHDIW	Units: µg/L	Analysis Date 5/4/05 5:29:14 PM		Prep Date 5/4/05				
Client ID:		Run ID: ORGC7_050504B			SeqNo: 503356						
Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Diesel (C12-C22)	501.7	50	500	0	100%	67	120	488	2.85%	15	
N-Tricosane	51.1	0.10	50.0	0	102%	70	130	50.5	1.21%	15	

**Qualifiers:**
ND - Not Detected at the Reporting Limit  
J - Analyte detected below quantitation limits

S - Spike Recovery outside accepted recovery limits  
R - RPD outside accepted recovery limits

B - Analyte detected in the associated Method Blank



5680 West End Road • Arcata • CA 95521-9202  
707-822-4649 Fax 707-822-6831

# Chain of Custody

P. 1 of 1

0505025

## LABORATORY NUMBER:

[illegible]

Attention: David Gervan  
Results & Invoice to: Laco Associates  
Address: 21 W. 4th St. Eureka CA 95501  
  
Phone: (707) 443-5054  
Copies of Report to: Ms. Valerie Ellis  
Forks Estate P.O. Box 1092 Kodiak, AK 99615 (907) 486-2042  
Sampler (Sign & Print): SJD

## PROJECT INFORMATION

Project Number: 3472.04  
Project Name: Totem Pole Market  
Purchase Order Number: TASK- 3023

[illegible]

**CONTAINER CODES:** 1— $\frac{1}{2}$  gal. pl; 2—250 ml pl; 3—500 ml pl; 4—1 L Nalgene; 5—250 ml BG; 6—500 ml BG; 7—1 L BG; 8—1 L cg; 9—40 ml VOA; 10—125 ml VOA; 11—4 oz glass jar; 12—8 oz glass jar; 13—brass tube; 14—other

**PRESERVATIVE CODES:** a—HNO<sub>3</sub>; b—HCl; c—H<sub>2</sub>SO<sub>4</sub>; d—Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>; e—NaOH; f—C<sub>2</sub>H<sub>5</sub>O<sub>2</sub>Cl; g—other

## SAMPLE CONDITION/SPECIAL INSTRUCTIONS

## GEOTRACKER

Cold, intact

## SAMPLE DISPOSAL

☒ NCL Disposal of Non-Contaminated

CHAIN OF CUSTODY SEALS Y/N/NA ☐ SHIPPED VIA: UPS Air-Ex Fed-Ex Bus Hand

\***MATRIX:** DW=Drinking Water; Eff=Effluent; Inf=Influent; SW=Surface Water; GW=Ground Water; S=Soil; O=Other.

**ALL CONTAMINATED NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT**



## *Attachment 4*

**LACO ASSOCIATES**  
**STANDARD OPERATING PROCEDURE No. 1 (revised September 2002)**  
**Hazardous Materials Investigation Procedures**

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## **SCOPE**

Standard Operating Procedures (SOP) No.1 is for the implementation of hazardous material investigation procedures including pre-site activities, field methodologies, and post-field work activities. Monitoring well sampling is covered in SOP No.2. SOP No.1 will be used by HAZWOPER-certified personnel in conjunction with the drilling file provided by the Project Manager to complete the required tasks in a consistent and standardized manner. Each section covers a specific task. Where multiple tasks are involved, refer to the appropriate section(s).

SOP No.1 will be reviewed annually through a systematic evaluation by Environmental Department personnel. If revised, an updated SOP will be published and forwarded to the appropriate regulatory agencies and personnel by January 31 of each new year.

## **PREPARATION AND COMPLETION**

### **Pre-field Activities**

The Project Manager will initiate the project by starting a drilling file, which ensures all pre and post drilling tasks are completed and details the proposed field activities (Attachment 1). The purpose of the drilling file is to facilitate efficient transfer of information and responsibility from the Project Manager (PM) to the Field Geologist and back to the PM upon completion of work. The drilling file will include the following information:

1. Copies of the workplan, approval letter, access agreements, and encroachment and drilling permits
2. USA and owner/tenant clearances
3. Order of work
4. List of supplies necessary for the installation
5. Timeline, budget, and allocation of resources
6. Site safety and health plan specifying personal protection equipment (PPE) anticipated for the project

The Project Manager establishes and ensures task due dates are met. The Field Geologist will direct the order of work and is ultimately responsible for the collection and recording of all field data.

### **Mobilization and Site Arrival**

Mobilization and site arrival covers the assembling of equipment and crew necessary for a particular project through implementation of the workplan at the project site.

1. Verify that equipment and supplies are present. Load drill rig or Geoprobe as applicable
2. Travel to site and notify site owner/operator of start of work
3. Field Geologist will hold tailgate safety meeting and complete a Field Safety Meeting form (Attachment 2)
4. Set up orange cones and “Closed Sidewalk” signs, as appropriate, and secure work area
5. Establish decontamination station, as appropriate

The Field Geologist is responsible for briefing the crew on relevant safety measures during the tailgate safety meeting. This shall take place on the first day of a project, whenever safety conditions change, when new crew members start work on the project, and at intervals of 10 days for long-term continuous projects.

### **Demobilization**

Demobilization consists primarily of returning the drill rig, Geoprobe, support vehicle, and any other equipment used in the course of a project back to pre-implementation condition. The Laboratory Manager or Vice President of Operations shall be notified of any non-disposable equipment lost or damaged during a project. Post implementation elements of the drilling file shall be completed by the Field Geologist and returned to the Project Manager when fieldwork for that phase of the project has been completed. The following shall be added to the drilling file prior to returning it to the Project Manager:

1. Boring and well construction logs
2. Field notes and drawings
3. Equipment and supply billing forms
4. Completed chain-of-custody for analytical laboratory samples
5. Brief written summary of work performed
6. Two copies of the Field Safety Meeting forms; original to the safety officer and one copy to the Project Manager

## **GENERAL METHODOLOGIES – DRILLING**

The following descriptions of work methods cover general tasks associated with drilling and sample collection.

### **Decontamination**

The majority of projects will not require the use of multiple decontamination zones. Separate wash and rinse tubs are adequate for most projects. The Project Manager will indicate in the order of work section of the drilling file if additional decontamination is required.

Sampling equipment will be decontaminated using an Alconox detergent spray with a clean water rinse. Drill bits and rods, augers, and rig tools shall be pressure washed, steam cleaned, or scrubbed with the Alconox and rinsed before and after use. Alconox and clean rinse water will be pumped through each low flow submersible pump prior to its use. Down-hole equipment shall never be lubricated with petroleum-based lubricants.

### **Waste Storage and Characterization**

#### Storage

1. Soil cuttings will be immediately secured in DOT-approved 55-gallon steel drums, sealed, and marked according to contents, boring of origin, and date of first accumulation, or may be added to an existing stockpile as approved by the Project Manager.
2. Purge water and equipment rinsate will be immediately secured in DOT-approved 55-gallon steel drums, sealed, and marked according to contents, boring of origin, and date of first accumulation.
3. Soil and water storage drums shall only be stored on-site, in a secure location provided by the client.
4. Free-phase gasoline or other hazardous material will be double contained in accordance with 40 CFR 264.175 (1993) in a secure location on-site, provided by the client.
5. Storage of soil known or suspected to qualify as designated or hazardous waste shall conform to the requirements of the Oversight Agency. At a minimum, soil shall be stockpiled on 10-mil PVC sheeting and shall be securely covered with 10-mil sheeting during wet weather periods.

#### Characterization

Characterization samples will be collected from each drum of wastewater, with methods appropriate for the necessary tests. Samples will be collected using a disposable bailer from the center of the water in the drum.

Samples from soil drums shall be composited by the laboratory in a ratio of 4 drums per 1 sample for analysis. Samples will be collected out of the approximate center of the soil in the drum. However, sampling technique will depend on the required analyses.

### **Borehole Logging**

A complete log will be maintained when soils are encountered during drilling operations (Attachment 3). A State of California Registered Geologist will review the completed log. Soils will be classified in accordance with ASTM D-2488 (Standard Practice for Description and Identification of Soils [Visual-Manual Procedure]). The Field Geologist will record the following data in the log:

1. Based on auger cuttings or soil samples, record visual-manual estimate of grain size percentages (sand, gravel, silt, clay) and describe the soil texture according ASTM D-2488.
2. Record color (Munsell), moisture, density, plasticity, and percent organics.
3. Note any hydrocarbon odor, staining, or sheen.
4. Record depth(s) to saturated soil(s).
5. Record Photoionization Detector (PID) results from bagged grab samples, if applicable.
6. If collecting samples by split-spoon, record SPT blow counts for every 0.5-foot penetration of the split-spoon sampler, driven by a standard 140-pound weight falling a standard distance.
7. Sampling depth(s) and methodologies.
8. Identify samples by sample ID (project number-boring number-depth-matrix), field point name (project number-boring number), and date.
9. Record monitoring well construction specifications or closure date and sealing material(s) for temporary borings.

## **SAMPLE COLLECTION AND HANDLING**

Refer to the Workplan and drilling file for the analytical suite, and to the laboratory for appropriate sample containers.

### **Surface Water**

1. Submerge a clean stainless steel dipper (or other suitable device) with minimal surface disturbance, allow the device to fill slowly and continuously, and retrieve the dipper/device from the surface water with minimal disturbance.
2. Remove the cap from the appropriate sample bottle provided by the laboratory and slightly tilt the mouth of the bottle below the dipper/device edge. Empty the dipper/device slowly, allowing the sample stream to flow gently down the inside of the bottle with minimal entry turbulence. Check that a Teflon septum is present in the cap, if required. Secure the cap tightly. When filling VOAs, ensure that no air is trapped inside the bottle by inverting and tapping. If any bubbles are observed, repeat the procedure.
3. Label the sample bottle with an appropriate sample tag. Be sure to label the tag carefully, legibly and clearly, addressing all the categories. Record sample information in field notes and complete a chain-of-custody form (Attachment 4).
4. Place the properly labeled sample bottle in a cooler maintained at 4°C throughout the sampling and transportation period.

### **Groundwater**

General procedures to be followed for sampling groundwater from a cased boring or hydropunch or screen point sampler:

1. Slowly lower bailer or pump into casing, do not drop.
2. Allow bailer or pump to fill.
3. Retrieve bailer or begin pumping.
4. Remove the cap from the appropriate sample bottle provided by the laboratory and slightly tilt the mouth of the bottle below the bailer or pump outlet. Fill the sample container slowly, allowing the sample stream to flow gently down the side of the bottle with minimal entry turbulence. Check that a Teflon septum is present in the cap, if required. Secure the cap tightly. When filling VOAs, ensure that no air is trapped inside the bottle by inverting and tapping. If any bubbles are observed, repeat the procedure.
5. Place the properly labeled sample bottle in a cooler maintained at 4°C throughout the sampling and transportation period.



## **Soils**

1. Place clean sample container on clean surface.
2. Place soil into appropriate sample container.
3. For samples contained in a brass tube, cap each end with Teflon tape or aluminum foil and a plastic cap.
4. Place the properly labeled sample container in a cooler maintained at 4°C throughout the sampling and transportation period.

## **Sample Coordination**

Review chain-of-custody and submit samples to laboratory upon return from the field. Alternate arrangements shall be made if sample holding times will expire before fieldwork is completed. Soil samples do not require additional packaging during transport; however, liquid samples should be packaged securely.

# **DRILLING FOR SUBSURFACE INVESTIGATION AND MONITORING WELL INSTALLATION**

Refer to the drilling file for drilling method(s), sampling depth(s), sampling method(s), and monitoring well construction specifications. The drill rig operator shall possess, or work for a company that possesses, a valid, current C-57 Well Driller's License. Installation, construction, and closure of borings and monitoring wells shall be in accordance with Bulletins 74-81 and 74-90, California. Variations from the California Well Standards must be authorized by the Oversight Agency, in advance. Rotary and direct push drilling procedures are discussed. General borehole logging and sample handling procedures are outlined in the General Methodologies Section.

## **Rotary Drilling**

Rotary drilling uses flighted augers to remove soil from a borehole. The purpose is to advance a borehole to a designated depth from which a sampler will be utilized to collect soil or groundwater samples, or install a casing to hold a borehole open. Augers are typically constructed in 5-foot lengths of heavy-duty steel that connect together. Caution is advised when lifting heavy equipment. Hollow stem augers are open in the middle and solid are not. Solid flight augers are generally used in cohesive soils. Non-cohesive soils require the use of hollow stem augers.

### *Solid Flight Augers*

Augers are advanced to the required depth and removed, then a soil sampler or casing is lowered into in the borehole.

### Soil Sampling

A soil sampler connected to drill rod(s) is advanced to the specified depth and retrieved. A steel split-spoon or push tube is used to collect soil samples (Figure 1).

1. Lift augers out of borehole and insert clean split-spoon or push tube sampler.
2. The split spoon is attached to heavy-duty drill-rods and the push tube to light weight rods.
3. Lower the assembly into the borehole.
4. Attach a slide hammer to the rods.
5. Without lifting the rods, advance the sampler to the specified depth.
6. Retract the rods to the starting depth and disconnect the slide hammer.
7. Attach a lifting nipple to the rods and retract the sampler.
8. Remove the soil from the sampler in a clean work area.

9. Follow soil sample collection and handling procedures.

### Groundwater Sampling

A well screen is installed to the specified depth for the retrieval of groundwater grab samples and recording of depth to water measurements (Figure 2). A bailer or bottom tubing check ball pump is typically used to collect groundwater samples.

### Temporary Screening Well Construction

1. Using new clean PVC pipe, saw-cut slots over the desired screen interval (typically 5 feet).
2. Place a cap on each end.
3. With the slotted end down, insert pipe to bottom of borehole.
4. If the boring is to be left overnight, or if it may receive surface runoff, place a bridge to a depth of 1 foot around the pipe followed by a bentonite seal.

### Groundwater Collection

1. Slowly lower the specified sampling device to approximately one foot above the bottom of the casing to minimize the amount of sediment collected in the groundwater sample.
2. Follow groundwater sample handling and collection procedures.

### Hollow Stem Augers

Hollow Stem Augers are used to prevent a borehole from collapsing during sample collection or well installation. Augers are advanced to the required depth and the drill rods are removed. A soil or hydropunch sampler is then be lowered down the hollow augers. When a continuous soil core is desired, a core barrel positioned inside the augers is simultaneously advanced to the specified depth. The augers function as a centralizer during placement of well casing and as a tremmie pipe during the placement of the annular materials.

### Soil Sampling

A soil sampler connected to drill rod(s) is lowered through the augers or advanced with the augers to the specified depth and retrieved (Figure 3).

1. Attach a clean push tube or split-spoon to the drill rods.
2. The push tube is attached to light weight rods and the split spoon to heavy-duty drill rods.
3. Lower the assembly into the borehole through the hollow stem augers.
4. Attach a slide hammer to the drill rods.
5. Without lifting the rods, advance the sampler to the specified depth.

6. Retract the rods to the starting depth and disconnect the slide hammer.
7. Attach a lifting nipple to the rods and retract the sampler.
8. In a clean work area remove the soil from the sampler.
9. Follow soil sample handling and collection procedures.

#### Hydropunch Sampling

A groundwater sampler connected to drill rod(s) is lowered through the augers, advanced to the specified depth and retracted to expose the sampler to the aquifer (Figure 4).

1. Assemble a clean hydropunch sampler with new slotted casing and expendable drive point. Check and replace damaged o-ring seals. Position a gouch tube over the shoe and drive point ensuring the point remains tightly against the shoe.
2. Attach the hydropunch sampler to the drill rods. Teflon tape should be placed on the threads.
3. Lower the assembly into the borehole through the hollow stem augers.
4. Attach the slide hammer to the drive rods.
5. Without lifting the drive rods, advance the assembly to the specified depth.
6. Retract the drive rods to the specified depth to open the sampler, secure the drive rods, and disconnect the slide hammer.
7. Follow groundwater sample handling and collection procedures.
8. Remove the drive rods and hydropunch assembly. The casing and drive point remain in the borehole.

#### Monitoring Well Installation

Augers are advanced to the required depth and the drill rods are removed. The augers are used to allow proper placement of the well casing and annular materials. Monitoring well construction specifications are outlined in the workplan and drilling file. Well installation can be a tedious process with several potential problems. The licensed well driller ultimately decides how the well installation will proceed.

1. Assemble a new well casing (screen and blank pipe) with a locking cap and end cap.
2. Lower assembly into the borehole through the hollow stem augers.
3. Pour sand inside the augers, according to the licensed well driller's instructions.

4. Once the sand pack is in place, place the annular seal according to the licensed well driller's instructions.
5. Complete the well by setting an access box in a concrete apron.
6. Tag or label the well with the number.

## **Direct Push**

Direct push uses a pneumatic hammer and hydraulic piston to advance soil and groundwater samplers or hollow drive rods to hold the borehole open during monitoring well installation. Rods are constructed in 5-foot lengths of heavy-duty steel that connect together. Caution is advised when lifting heavy rods.

### *Soil Sampling (Macrocore)*

A piston rod soil sampler (Macrocore) connected to the lead drive rod is advanced to the specified depth, the piston rod is removed, and the sampler is advanced to the appropriate depth and retrieved (Figure 6).

#### Sampler Assembly, Advancement, and Sample Collection

1. Assemble a clean Macrocore as specified. Check and replace damaged O-ring seals.
2. Attach the Macrocore to the drive rods.
3. Advance the Macrocore to the specified depth.
4. Remove the piston rod.
5. Advance the Macrocore through the desired sampling interval (4 feet or less).
6. Retract the sampler.
7. In a clean work area remove the core from the sampler.
8. Cut open the plastic liner.
9. Follow soil sample handling and collection procedures.

### *Groundwater Sampling (Screen Point Sampler)*

A screen-point sampler connected to drive rod(s) is advanced to the specified depth (Figure 7). The sheath is retracted to expose the screen and a bottom tubing check ball pump or peristaltic pump is used to collect groundwater samples.

#### Screen Point Sampler Assembly and Advancement

1. Assemble a clean screen point sampler with new expendable drive point. Check and replace damaged O-ring seals.
2. Attach the sampler to the drive rods with new O-rings placed on the top of each rod.
3. Advance the sampler to the specified depth.

4. Retract the drive rods to expose the screen (4 feet or less).

#### Groundwater Collection

1. Slowly lower the specified sampling device to the bottom of the screen point sampler.
2. Follow groundwater sample handling and collection procedures.
3. Remove the drill rods and sampler assembly.
4. The drive point remains in the borehole.

#### *Monitoring Well Installation*

3.25-inch diameter hollow drive rods are advanced to the required depth with an expendable tip. The hollow rods are used to allow proper placement of the well casing and annular materials. Monitoring well installation specifications are outlined in the workplan and drilling file. Well installation can be a tenuous process with several potential problems. The licensed well driller ultimately decides how the well construction will proceed.

1. Assemble a new well casing (screen and blank pipe) with a locking cap and end cap.
2. Lower assembly into the drive rods.
3. Pour sand inside the rods, according to the licensed well driller's instructions.
4. Once the sand pack is in place, place the annular seal according to the licensed well driller's instructions.
5. Complete the well by setting an access box in a concrete apron.
6. Tag or label the well with the number.

#### **Hand Auger**

A hand auger uses an auger bucket and connecting rods to remove soil from a borehole for the purpose for advancing a boring to a sampling depth. A sampler is then used to collect soil samples or a casing is installed to hold the borehole open. 1-inch diameter monitoring wells can also be installed. Buckets are typically one foot long. Connecting rods are typically constructed in 4-foot lengths of steel. A hand auger is used when drill rig access is limited, utilities are too close, or the total depth is generally less than 5 feet.

#### *Soil Sampling*

A steel push tube is used to collect soil samples (Figure 9). The sampler is connected to drive rod(s) and is advanced to the specified depth using a slide hammer. Sampler is

retrieved by hammering in the opposite direction. Refer to soil sample collection and handling procedures.

#### *Groundwater Sampling*

A slotted casing is installed to the specified depth for the retrieval of groundwater grab samples and recording of depth-to-water measurements (Figure 10). A bailer or peristaltic pump is typically used to collect groundwater samples. Refer to groundwater sample collection and handling procedures.

#### *Monitoring Well Construction*

Auger the borehole to the required depth (Figure 11). Monitoring well construction specifications are outlined in the workplan and drilling file.

1. Assemble a new well casing (screen and blank pipe) with a locking cap and end cap.
2. Lower assembly into the borehole.
3. Pour sand and place the annular seal according to the well driller's instructions.
4. Complete the well by setting an access box in a concrete apron.
5. Tag or label the well with the number.



# **MONITORING WELL DEVELOPMENT AND SURVEYING**

## **Monitoring Well Development**

Following installation of a monitoring well it must be developed before it is brought into service. Developing a well removes sediment in the sand pack and on the borehole wall, and maximizes recharge to the well. Monitoring wells are to be developed prior to setting the seal or a minimum of 72 hours after setting the seal, according to procedures generally described in 40 CFR 264.175.

1. Measure and record total depth of boring and depth-to-water for each well to be developed. Depth-to-water will be measured with an electronic depth sensor or engineers tape (0.01-foot increments) and water sensitive paste. Measurements will be recorded to the nearest 0.01-foot from the top of casing (TOC).
2. Develop wells by slowly inserting and withdrawing an appropriately sized surge block through the entire water column without rising above the water surface. This is *surging* the wells.
3. After 5 minutes quickly remove the surge block and insert a submersible pump with the intake no less than 2 feet off the bottom. If well diameter is too small for a submersible pump, a bailer should be used.
4. Purge water from the well at a rate of 1 to 2 gallons per minute [gpm], until clarity is reached. This is *purging* the well. Surging and purging may be repeated as necessary, but should be progressively gentler.
5. Complete a monitoring well field worksheet (Attachment 5).
6. A newly developed well is to be sampled no sooner than 24 hours after development. Refer to SOP No. 2 for monitoring well sampling procedures.

## **Wellhead Surveying**

The reference elevation with respect to NAVD-88 for the top of casing (TOC) for each monitoring well or temporary screening well will be determined by survey to the nearest 0.01 foot. Surveys are to be performed under the supervision of a licensed land surveyor with the appropriate equipment and operated and calibrated in accordance with the manufacturer's recommended procedures. In all cases, wells shall be located horizontally under the supervision of a licensed land surveyor to the State Plane Coordinate System.

## **REFERENCES**

ASTM D-2488  
40 CFR 264.175  
California Well Standards Bulletin 74-81  
California Well Standards Bulletin 74-90

## **LIST OF FIGURES**

Figure 1	Soil Sampling with Solid Flight Augers
Figure 2	Groundwater Sampling with Solid Flight Augers
Figure 3	Soil Sampling with Hollow-Stem Rotary Augers
Figure 4	Hydropunch Sampling with Hollow-Stem Rotary Augers
Figure 5	Monitoring Well Construction with Hollow-Stem Rotary Augers
Figure 6	Direct-Push Soil Sampling with Macrocores
Figure 7	Direct-Push Depth-Discrete Groundwater Sampling
Figure 8	Direct-Push Monitoring Well Construction
Figure 9	Hand-Auger Soil Sampling
Figure 10	Hand-Auger Groundwater Sampling
Figure 11	Hand-Auger Monitoring Well Construction

## **LIST OF ATTACHMENTS**

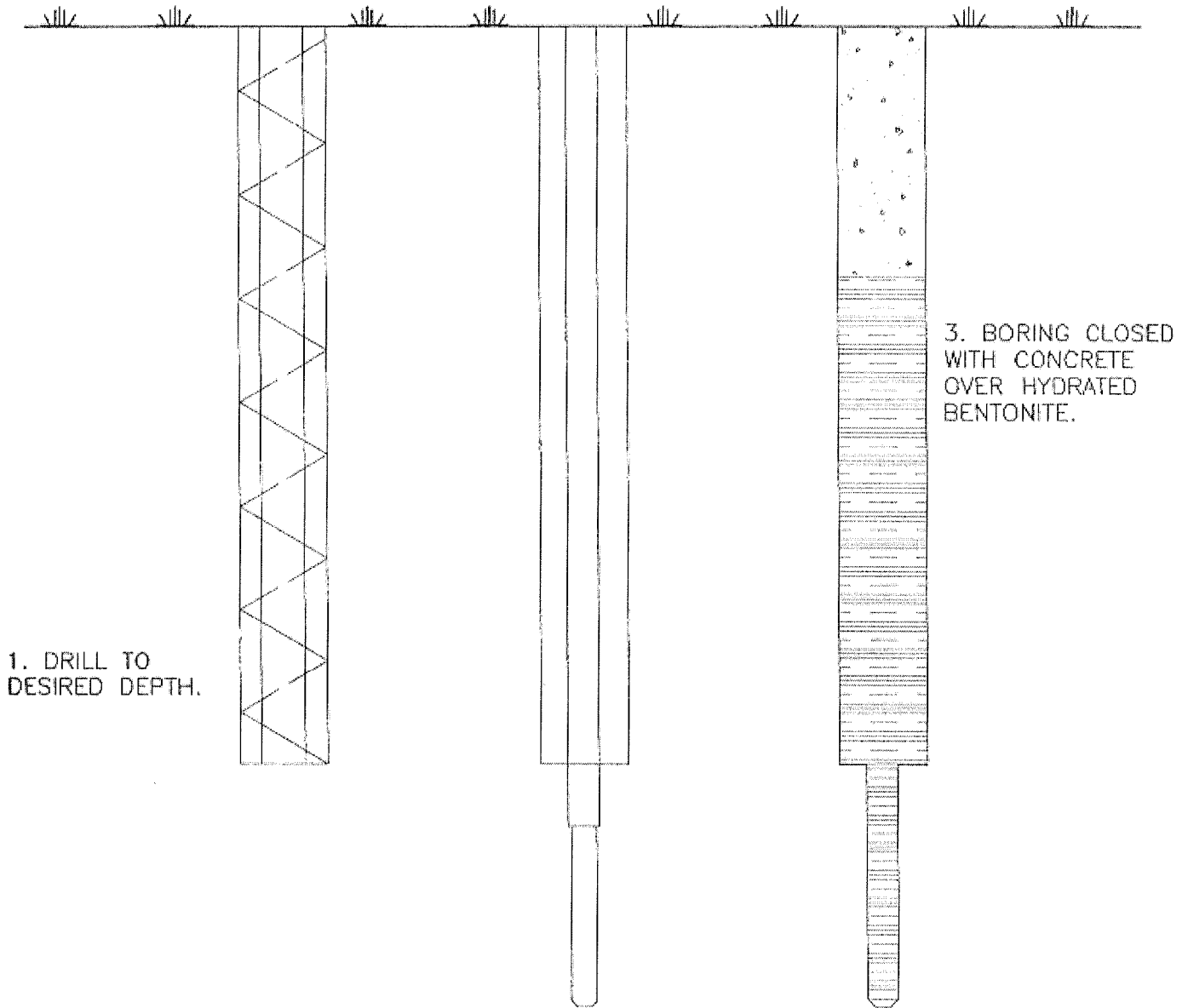
Attachment 1	Drilling File Checklist
Attachment 2	Field Safety Meeting Form
Attachment 3	Soil Boring Log
Attachment 4	Chain of Custody
Attachment 5	Monitoring Well Sampling Field Form

## **FIGURES**



**LACO ASSOCIATES**  
CONSULTING ENGINEERS  
21 W 4TH ST. EUREKA, CA 95501 (707)443-5054

PROJECT	STANDARD OPERATING PROCEDURES		BY	BAB	FIGURE	1
CLIENT			DATE	8/21/02		
LOCATION	TYPICAL SOLID FLIGHT AUGER SOIL SAMPLING		CHECK		JOB NO.	
			SCALE	NTS		



1. DRILL TO  
DESIRED DEPTH.

2. REMOVE AUGER AND  
DRIVE SAMPLER INTO  
FORMATION, THEN  
REMOVE SAMPLER.

3. BORING CLOSED  
WITH CONCRETE  
OVER HYDRATED  
BENTONITE.



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PROJECT STANDARD OPERATING PROCEDURES

BY: BAB

FIGURE

2

CLIENT

DATE 8/21/02

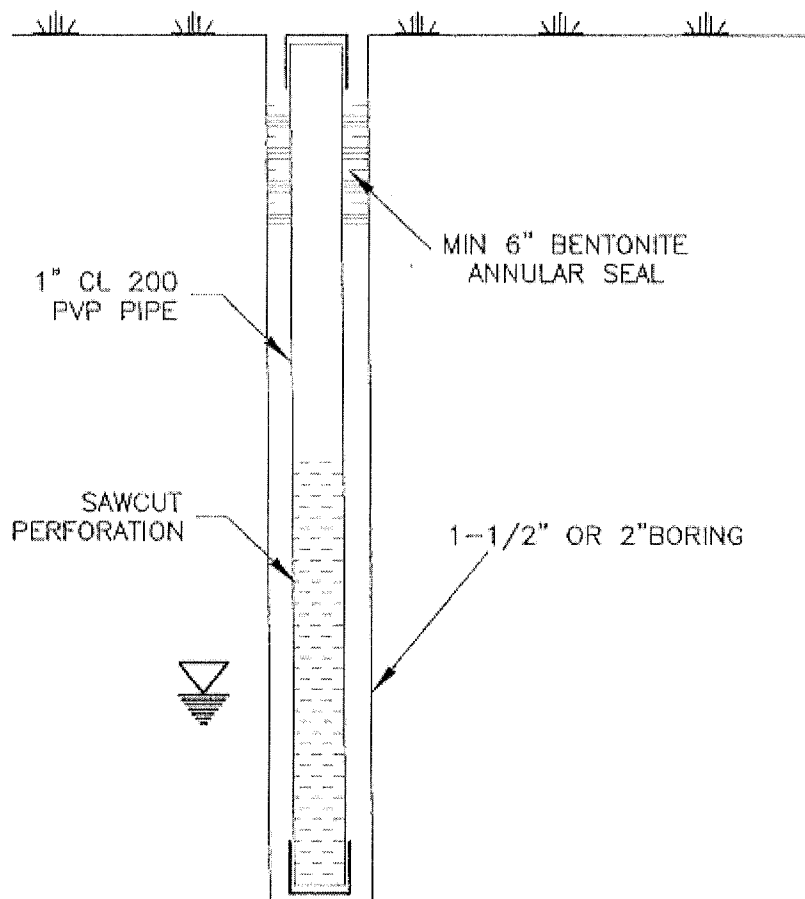
LOCATION

CHECK

JOB NO.

TYPICAL SOLID FLIGHT AUGER GROUNDWATER SAMPLING

SCALE NTS



#### A. SCREENING WELL (NO WELLPOINT)

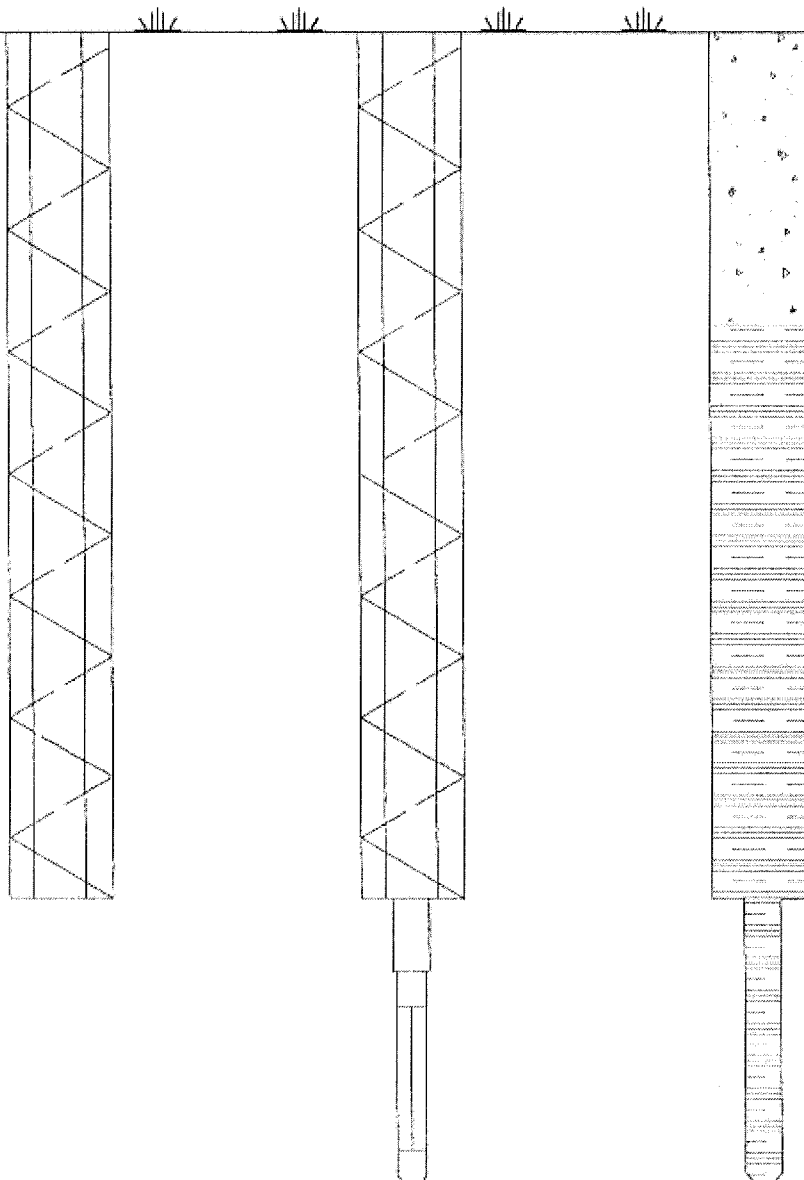
USED IN AREAS FREE OF SURFACE  
CONTAMINATION OR OTHER CONTAMINATION  
NOT CURRENTLY IN CONTACT WITH  
GROUNDWATER CLOSED WITHIN 72 HOURS.



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PROJECT	STANDARD OPERATING PROCEDURES	BY	BAB	FIGURE	3
CLIENT		DATE	8/21/02	JOB NO.	
LOCATION		CHECK			
	TYPICAL HOLLOW STEM AUGER SOIL SAMPLING	SCALE	NTS		

1. DRILL TO  
DESIRED DEPTH.



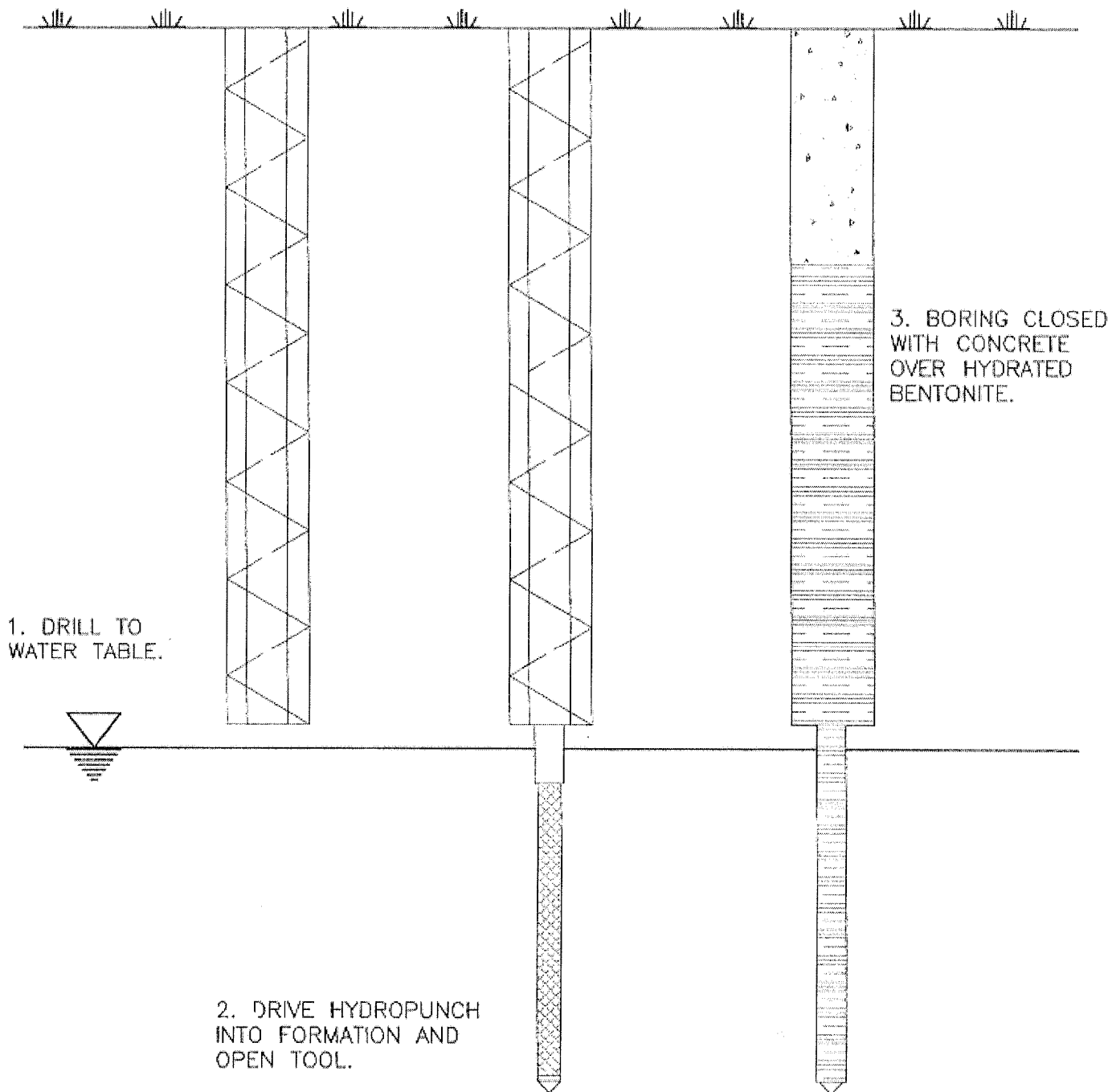
3. BORING CLOSED  
WITH CONCRETE  
OVER HYDRATED  
BENTONITE.

2. DRIVE SAMPLER INTO  
FORMATION, THEN  
REMOVER SAMPLER.



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PROJECT	STANDARD OPERATING PROCEDURES		BY	BAB	FIGURE	4
CLIENT			DATE	8/21/02		
LOCATION			CHECK		JOB NO.	
TYPICAL HYDROPUNCH BORING			SCALE	NTS		

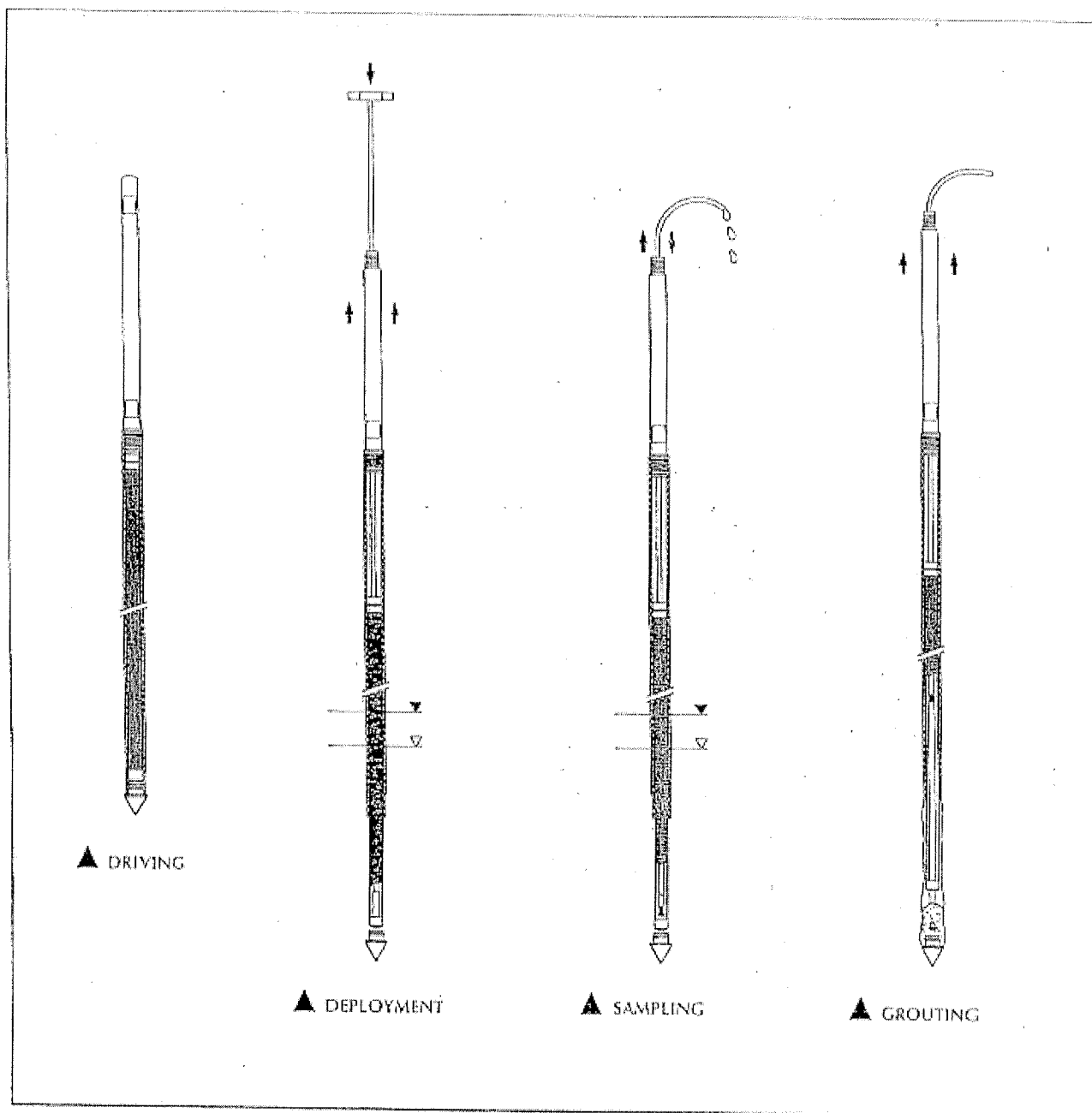




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PROJECT	STANDARD OPERATING PROCEDURES	BY	BAB	FIGURE	7
CLIENT		DATE	8/21/02	JOB NO.	
LOCATION	GROUNDWATER SAMPLING	CHECK			
		SCALE	NTS		

## GEOPROBE® SCREEN POINT 16 GROUNDWATER SAMPLERS

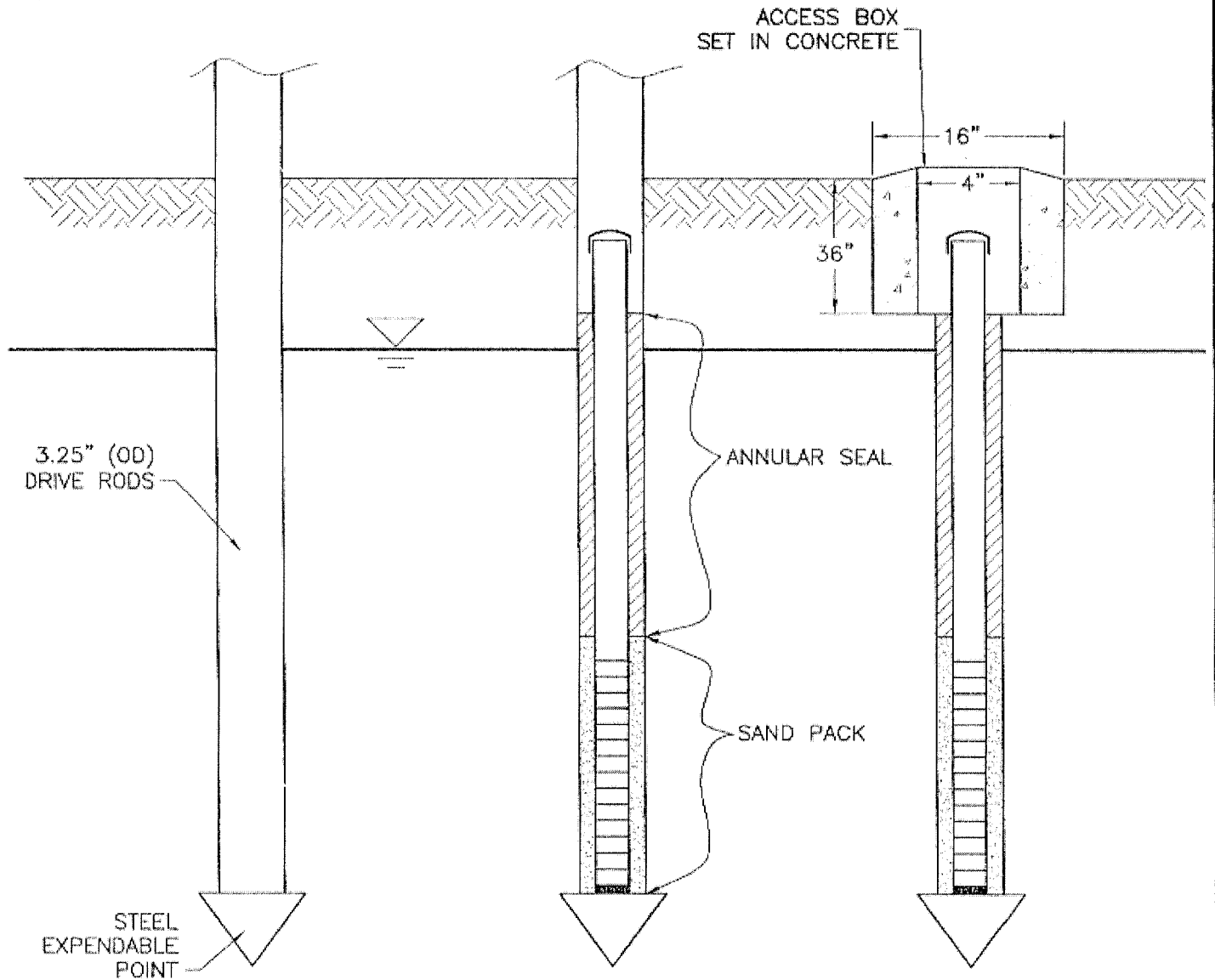






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PROJECT	STANDARD OPERATING PROCEDURES	BY	BAB	FIGURE	8
CLIENT		DATE	5/28/02	JOB NO.	
LOCATION		CHECK			
	DIRECT PUSH MONITORING WELL	SCALE	NTS		



1. DRIVE SEALED  
DUAL TUBE TO  
TOTAL DEPTH

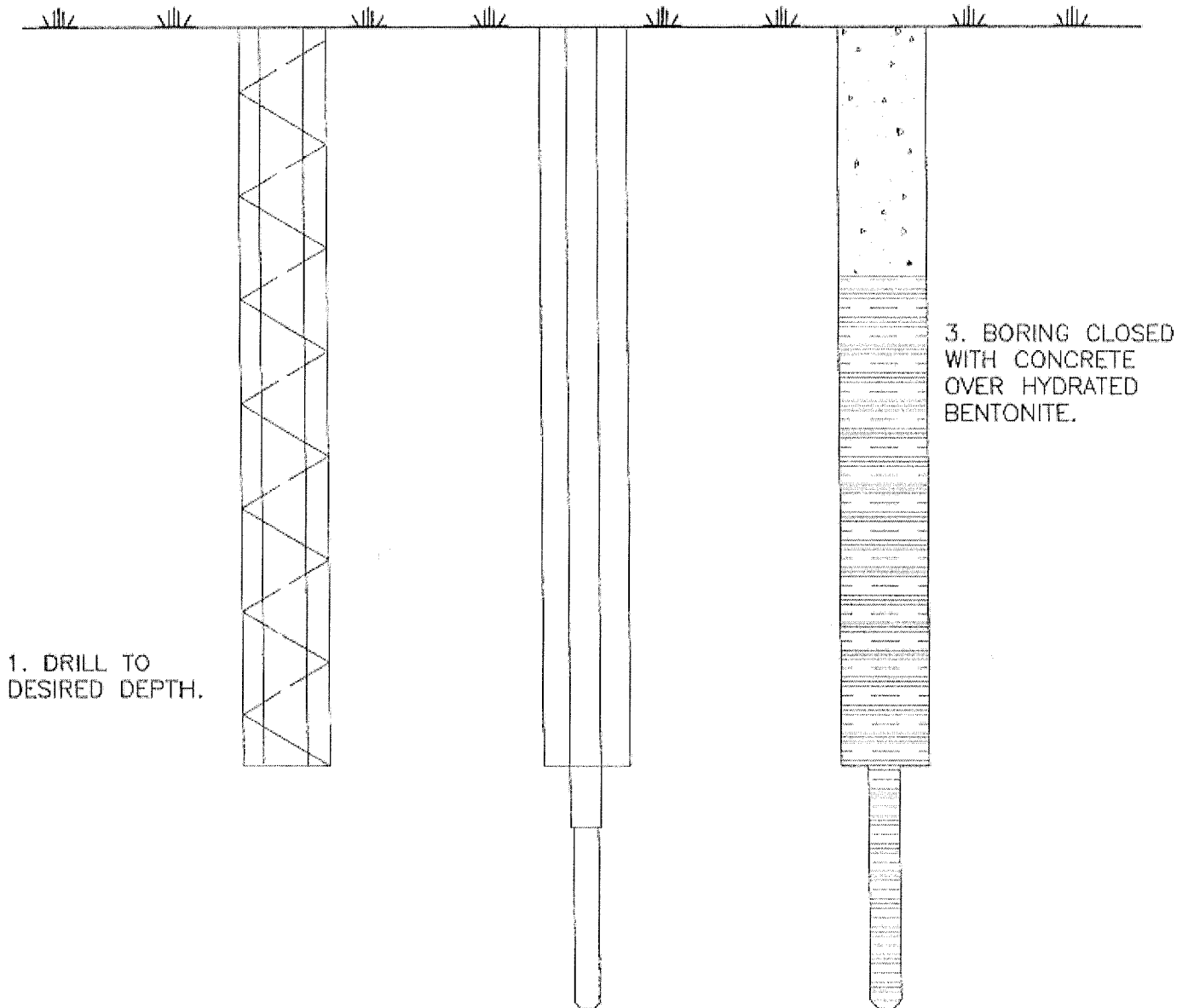
2. SET 1.5" PVC  
SCREEN & BLANK PIPE  
& ANNULAR MATERIALS,  
EXTRACT RODS

3. SET ACCESS BOX  
IN CONCRETE 36"x16"



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PROJECT	STANDARD OPERATING PROCEDURES	BY	BAB	FIGURE	9
CLIENT		DATE	8/21/02	JOB NO.	
LOCATION		CHECK			
	TYPICAL HAND AUGER SOIL SAMPLING	SCALE	NTS		



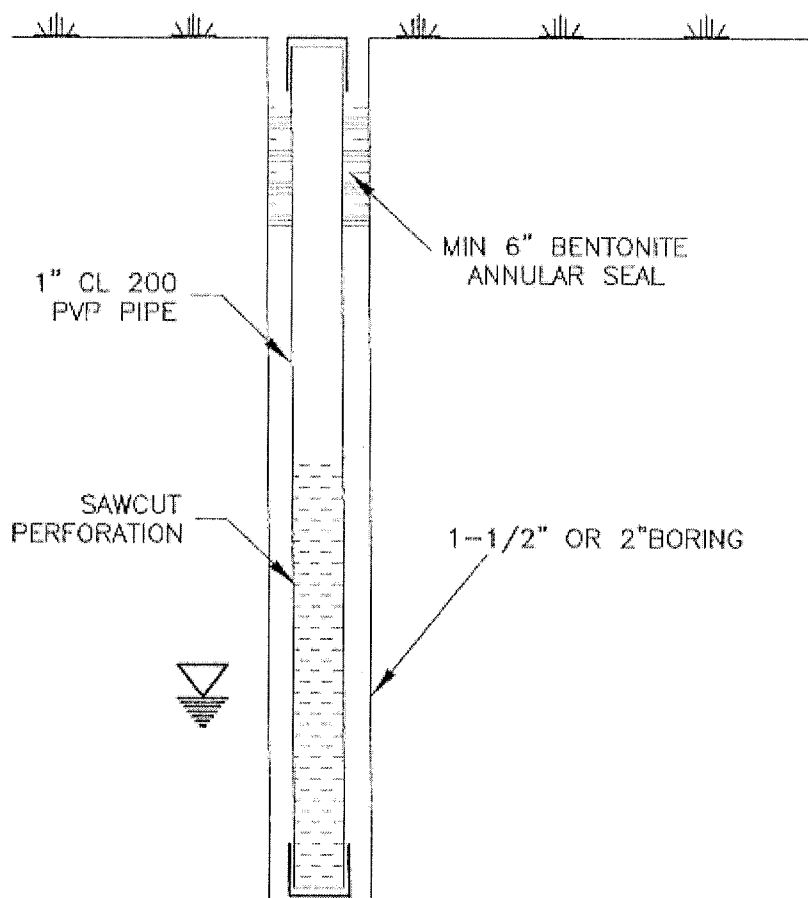
2. REMOVE AUGER AND  
DRIVE SAMPLER INTO  
FORMATION, THEN  
REMOVE SAMPLER.

3. BORING CLOSED  
WITH CONCRETE  
OVER HYDRATED  
BENTONITE.



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PROJECT	STANDARD OPERATING PROCEDURES		BY	BAB	FIGURE	10
CLIENT			DATE	8/21/02		
LOCATION			CHECK		JOB NO.	
TYPICAL HAND AUGER GROUNDWATER SAMPLING			SCALE	NTS		



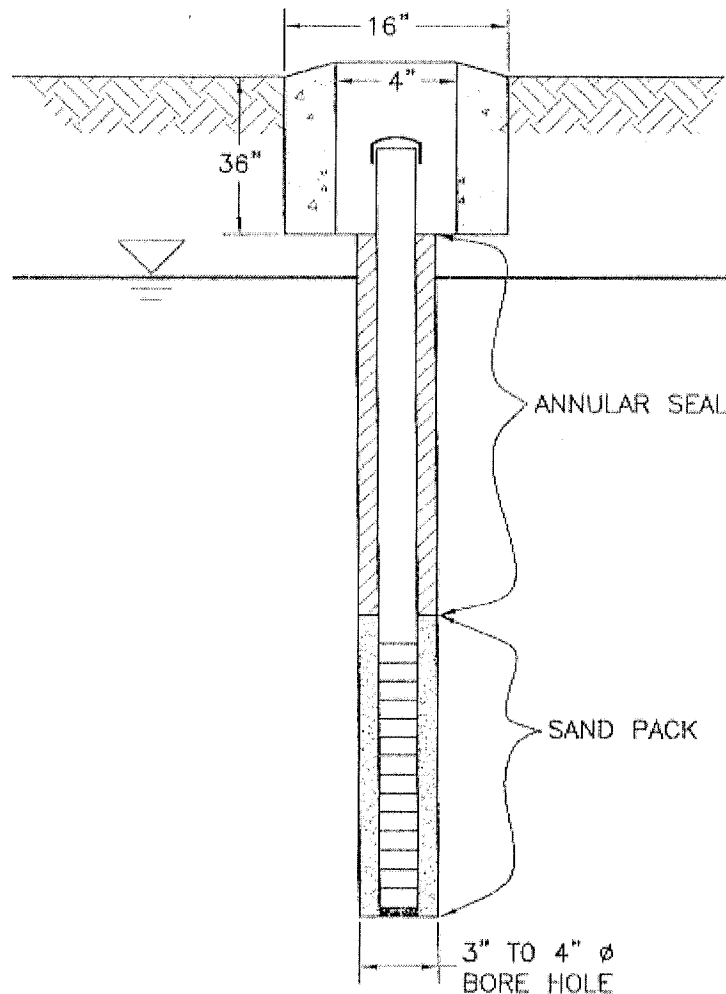
A. SCREENING WELL (NO WELLPOINT)

USED IN AREAS FREE OF SURFACE  
CONTAMINATION OR OTHER CONTAMINATION  
NOT CURRENTLY IN CONTACT WITH  
GROUNDWATER CLOSED WITHIN 72 HOURS.



**LACO ASSOCIATES**  
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21 W 4TH ST. EUREKA, CA 95501 (707)443-5054

PROJECT STANDARD OPERATING PROCEDURES			BY BAB	FIGURE
CLIENT		DATE	8/21/02	11
LOCATION		CHECK		JOB NO.
TYPICAL HAND AUGER MONITORING WELL			SCALE NTS	



1. HAND AUGER TO  
DESIRED DEPTH

2. SET 1" TO 1.5" PVC  
SCREEN & BLANK PIPE  
& ANNULAR MATERIALS.

3. SET ACCESS BOX  
IN CONCRETE 36"x16"

## **ATTACHMENTS**

Project Name \_\_\_\_\_  
Project Manager \_\_\_\_\_

Project Number \_\_\_\_\_  
Date initiated \_\_\_\_\_

Task   Initials   Date

Due Date

**Project Manager (PM)**

- ☐ Project initiation, *PM obtains blank drilling file from Drilling Coordinator (DC)*  
*(15 to 30 days prior to drilling day)*.....

- |    |       |                                                                                                                                                                            |
|----|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 40 | _____ | <input type="checkbox"/> <input type="checkbox"/> Work Plan reviewed by PM                                                                                                 |
| 40 | _____ | <input type="checkbox"/> <input type="checkbox"/> Addenda (where appropriate) reviewed by PM                                                                               |
| 40 | _____ | <input type="checkbox"/> <input type="checkbox"/> Regulatory approval letter reviewed by PM                                                                                |
| 40 | _____ | <input type="checkbox"/> <input type="checkbox"/> Fund pre approval documents (where appropriate) reviewed by PM                                                           |
| 40 | _____ | <input type="checkbox"/> Contact Drilling company for tentative start date (if other than Lake's Well Drilling)                                                            |
| 40 | _____ | <input type="checkbox"/> <input type="checkbox"/> Initial Preferred field personnel, tentative start work date, budget, order of work (Drilling File Form-1) created by PM |
| 40 | _____ | <input type="checkbox"/> <input type="checkbox"/> Initial preferred field personnel approval, approved by Vice President of Operations (VPO)                               |
| 40 | _____ | <input type="checkbox"/> <input type="checkbox"/> Site Map obtained by PM with locations of existing and proposed holes indicated                                          |
| 40 | _____ | <input type="checkbox"/> <input type="checkbox"/> Site Safety Plan obtained by PM                                                                                          |
| 40 | _____ | <input type="checkbox"/> PM forwards drilling file to DC                                                                                                                   |

**Permitting Team**

- |    |       |                                                                                                                                                                               |
|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 33 | _____ | <input type="checkbox"/> Drilling permit request, <i>DC reviews file (8 to 20) days prior to drilling day</i> .....                                                           |
|    | _____ | <input type="checkbox"/> DC forwards drilling file to DC assistant                                                                                                            |
|    |       | <input type="checkbox"/> DC Assistant obtains the following forms, <i>submits a copy to the drilling file and once original is returned, submits it to the drilling file.</i> |
| 51 | _____ | <input type="checkbox"/> Private property access agreement <input type="checkbox"/> Submitted <input type="checkbox"/> Original received and copy to file                     |
| 51 | _____ | <input type="checkbox"/> Encroachment permit <input type="checkbox"/> Submitted <input type="checkbox"/> Original received and copy to file                                   |
| 33 | _____ | <input type="checkbox"/> Drilling permit application <input type="checkbox"/> Submitted <input type="checkbox"/> Original received and copy to file                           |
| 33 | _____ | <input type="checkbox"/> <input type="checkbox"/> Site Clearances, (Drilling File Form-2), <i>site clearance information gathered by DC assistant</i>                         |
| 33 | _____ | <input type="checkbox"/> <input type="checkbox"/> Parcel Map and list of property owners, (if applicable)                                                                     |
| 33 | _____ | <input type="checkbox"/> <input type="checkbox"/> USA marks, <i>DC defines USA area on map</i>                                                                                |
| 33 | _____ | <input type="checkbox"/> Drilling file review, <i>reviewed by DC and forwarded to PM</i>                                                                                      |

**Project Manager**

- |    |       |                                                                                                                               |
|----|-------|-------------------------------------------------------------------------------------------------------------------------------|
| 40 | _____ | <input type="checkbox"/> Drilling file review for completeness, <i>reviewed by PM, (5 to 10 days prior to drilling day)</i>   |
| 40 | _____ | <input type="checkbox"/> <input type="checkbox"/> Final field personnel request, (Drilling File Form-3) created by PM         |
| 40 | _____ | <input type="checkbox"/> <input type="checkbox"/> Final personnel approval, <i>approved by VPO (See Drilling File Form-3)</i> |

**Geologist (5 to 10 days prior to drilling day)** .....

- |    |       |                                                                                                                               |
|----|-------|-------------------------------------------------------------------------------------------------------------------------------|
| 40 | _____ | <input type="checkbox"/> Drilling file review, <i>reviewed by Geologist</i>                                                   |
| 40 | _____ | <input type="checkbox"/> Meeting-discuss tasks not clearly defined and background information, <i>Geologist meets with PM</i> |
| 40 | _____ | <input type="checkbox"/> Meeting-reconfirmation start date and personnel, <i>Geologist schedules meeting with DC, PM, VPO</i> |

Project Name \_\_\_\_\_  
Project Manager \_\_\_\_\_

Project Number \_\_\_\_\_  
Date initiated \_\_\_\_\_

Task	Initials	Date	Due Date
------	----------	------	----------

**Geologist continued (5 to 10 days prior to drilling day)** .....

- |    |  |                                                                                                                                                                                                |  |
|----|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 51 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> Notification of work schedule, <i>Geologist personally notifies by phone and documents, (See Drilling File Form-2)</i>            |  |
| 51 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> Owners                                                                                                                            |  |
| 51 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> Tenants                                                                                                                           |  |
| 51 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> Private Property Owners                                                                                                           |  |
| 51 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> Public Agencies                                                                                                                   |  |
| 40 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> Well hardware list, (Drilling File Form-4), <i>created by Geologist, given to DC</i>                                              |  |
| 40 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> Well hardware ordered, (See Drilling File Form-4) <i>ordered by DC and form returned to Geologist</i>                             |  |
| 40 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> Laboratory container order, <i>ordered by DC</i>                                                                                  |  |
| 33 |  | <input type="checkbox"/> Schedule of Site Markings, <i>Geologist arranges for site to be USA marked by field tech</i>                                                                          |  |
| 33 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> Site Markings, <i>Field tech marks site, signs and dates site map, submits to PM and geologist (5 days prior to drilling day)</i> |  |
| 33 |  | <input type="checkbox"/> Meeting-DC meets with Geologist to discuss USA description of work area                                                                                               |  |

**Project Manager (5 days prior to drilling day)** .....

- |    |  |                                                                                                                                                                                                                                 |  |
|----|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 33 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> USA contact and #, <i>PM calls in ticket and records start work date and time, ticket # and renewal date (5 days prior to drilling) (See Drilling File Form-2)</i> |  |
| 48 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> Regulatory agency contact, <i>PM calls regulatory agency with confirmed start date (1 to 2 days prior to drilling day) (See Drilling File Form-2)</i>              |  |

**Project Manager (1 day prior to drilling day)** .....

- |    |  |                                                                      |  |
|----|--|----------------------------------------------------------------------|--|
| 40 |  | <input type="checkbox"/> Drilling file review, <i>reviewed by PM</i> |  |
|----|--|----------------------------------------------------------------------|--|

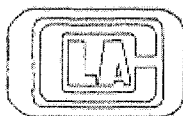
**Drilling Starts (Follow SOP #1)** .....

**Geologist**

- |    |  |                                                                                                                                                         |  |
|----|--|---------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 40 |  | <input type="checkbox"/> Field Notes, <i>collected by Geologist(5 days after drilling)</i>                                                              |  |
| 40 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> Boring and well construction logs                                                          |  |
| 40 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> Field notes and drawings                                                                   |  |
| 40 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> Equipment and supply billing forms                                                         |  |
| 40 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> Chain of Custody for analytical lab samples                                                |  |
| 40 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> Written summary of work performed                                                          |  |
| 40 |  | <input type="checkbox"/> <input checked="" type="checkbox"/> Completed site safety form, submit copy to LACO safety officer, (See Drilling File Form-5) |  |

**Project Manager**

- |    |  |                                                                                                                                        |  |
|----|--|----------------------------------------------------------------------------------------------------------------------------------------|--|
| 40 |  | <input type="checkbox"/> Drilling file review, <i>PM reviews file and distributes appropriate information. (5 days after drilling)</i> |  |
|----|--|----------------------------------------------------------------------------------------------------------------------------------------|--|



LACO ASSOCIATES  
CONSULTING ENGINEERS

(707) 443-5054

21 W 4th STREET EUREKA, CA 95501

# FIELD SAFETY MEETING

Complete and return to LACO Safety Officer

PROJECT NAME / NUMBER: \_\_\_\_\_ DATE: \_\_\_\_\_

MEETING HELD BY: \_\_\_\_\_ (Field Supervisor)

PERSONS ATTENDING: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

HAZARDS NOTED & DISCUSSED: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

☐ Slip, Trip Fall; \_\_\_\_\_

☐ Personal Protective Equipment; \_\_\_\_\_

☐ Public Safety Protection; \_\_\_\_\_

☐ Hazardous Materials; \_\_\_\_\_

☐ Emergency Action Plan; \_\_\_\_\_

ATTENDEES SIGNATURES: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_





**LAGOS ASSOCIATES**  
CONSULTING ENGINEERS

21 West Fourth Street, Eureka, CA 95501  
TEL 707.443.5054  
FAX 707.443.0553

PROJECT NAME: \_\_\_\_\_  
PROJECT NO.: \_\_\_\_\_  
DATE: \_\_\_\_\_  
DRILLER: \_\_\_\_\_  
PM: \_\_\_\_\_  
LOGGED BY: \_\_\_\_\_

GLOBAL ID: \_\_\_\_\_  
FIELD POINT NAME: \_\_\_\_\_  
DRILLING METHOD: \_\_\_\_\_  
AUGER/ROD DIAMETER (in): \_\_\_\_\_  
LOCATION: \_\_\_\_\_  
ELEVATION (ft): \_\_\_\_\_

LOGGED BY:		ELEVATION (ft):										SAMPLING METHOD:				ANALYTICS:		CLOSURE:																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
DEPTH (ft)		COLOR (MUNSELL)		SILT AND CLAY				SAND AND GRAVEL				PURGE VOLUME:		PURGE METHOD:		DEPTH TO WATER (ft):		CASING TYPE/DIAMETER (in):		SCREEN INTERVAL (ft bgs):																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
				%CLAY		%SILT		PLASTICITY		N=NONE L=LOW M=MEDIUM H=HIGH		CONSISTENCY		S=SOFT F=FIRM H=STIFF H-HARD		%SAND		F=FINE M=MEDIUM C=COARSE		%GRAVEL		F=FINE M=MEDIUM C=COARSE		SHAPE/ANGULARITY		DENSITY				ASTM D-2488 GROUP SYMBOL		MOISTURE		% ORGANICS		ODOR		PID (ppm)		SAMPLE		LOCATION MAP		OTHER REMARKS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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LABORATORY NUMBER:

PRIOR AUTHORIZATION IS REQUIRED FOR RUSHES

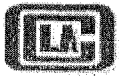
PRESERVATIVE CODES: a—HNO<sub>3</sub>; b—HCl; c—H<sub>2</sub>SO<sub>4</sub>; d—Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>; e—NaOH; f—C<sub>2</sub>H<sub>5</sub>O<sub>2</sub>Cl; g—other

SAMPLE CONDITION/SPECIAL INSTRUCTIONS

SHIPPED VIA: UPS Air-Ex Fed-Ex Bus Hand

\***MATRIX:** DW=Drinking Water; Eff=Effluent; Inf=Influent; SW=Surface Water; GW=Ground Water; S=Soil; O=Other.

ALL CONTAMINATED NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT



# LACO ASSOCIATES

CONSULTING ENGINEERS

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Project  
Name:

Tech:

Mob/Demob time:

Project No.:

Travel time:

Date:

Time on site:

Golba! ID No.:

Time off site:

PW:

Mileage:

WELL No.		DIAMETER (in)		TOTAL DEPTH (ft)		DEPTH TO WATER (ft)					
INITIAL		FINAL		INITIAL		FINAL		INITIAL		FINAL	
FIELD INTENSITIES	PH										
	TEMP (°C)										
	Scw (µmhos)										
	ORP (mV)										
	DO (mg/L)										
	OTHER (units)										
PURGE	TIME										
	METHOD (DHP/CR/S)										
	RATE (gpm)										
	VOLUME (gal)										
	COLOR										
	OD(R)										
REMARKS											
SAMPLE	TIME										
	METHOD (DHP/CR/S)										
	ANALYTES										
	REMARKS										

DHP=DOWN HOLE PUMP CR=CHECK BALL S=SALER FD=FIELD DUPLICATE MB=METHOD BLANK FF=FIELD FILTERED

REVISED:4/30/02

Attachment 5